JULY 1937

PAPER TRADE JOURNAL

THE INTERNATIONAL WEEKLY OF THE PAPER AND PULP INDUSTRY AND THE PIONEER PUBLICATION IN ITS FIELD

Established 1886

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JULY
1
1937

Vol. CV
No. 1

66th Year

REPORT OF SUPERINTENDENT'S CONVENTION

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PAPER TRADE JOURNAL

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PAPER TRADE JOURNAL

Reg. U. S. Pat. Off.

SIXTY-SIXTH YEAR

PAPER

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Superintendents Hold Successful Convention

Eighteenth Annual Meeting At Springfield, Mass., June 23-25 Is Largely Attended and Is Complete Success In Every Respect — R. B. Millidge, of Howard Smith Paper Mills, Is Chosen President for Ensuing Year.

[FROM OUR REGULAR CORRESPONDENT]

SPRINGFIELD, Mass., June 25, 1937.—The eighteenth annual convention and machinery exhibition of the American Pulp and Paper Mill Superintendents Association was held here June 23-25 in the Industrial Arts Building, at the Eastern States Exposition grounds in West Springfield. The convention was decidedly successful both as regards attendance and number of exhibitors. The exhibits, which numbered almost 90, would compare favorably with any of the other industrial exhibitions, and it was certainly by far the greatest exposition of paper and pulp mill machinery and equipment ever assembled.

Springfield, a Happy Choice

Springfield was a happy choice for the convention site as it is in the important paper mill district of western Massachusetts, thus making plenty of mills available for visits and making it convenient for a large number of local superintendents to attend.

The convention got underway Wednesday morning which was devoted to registration and inspection of the many exhibits. Later on there was the annual golf tournament held at the Springfield Country Club, and mill visits to the Chapman Valve Company plant at Indian Orchard, to the Strathmore Paper Company mill at Woronoco, where the superintendents had an opportunity to see how blue print and high grade rag content papers are manufactured. Another group went to Holyoke and visited the Linden and Gill Divisions of the American Writing Paper Company.

That evening in the Industrial Arts Building the committee put on an old fashioned New England clam bake which seemed very popular with the diners, especially those from other sections of the country who had never enjoyed a clam bake before.

Welcomed Paper Men To Springfield

Wm. H. Flood, president of the Springfield Chamber of Commerce and the Hon. Henry Martens, mayor of Springfield, welcomed the paper men to Springfield. James A. Deerdon, member of the West Springfield board of selectmen and purchasing agent of the Strathmore Paper Company at Woronoco, extended the greetings of West Springfield to the convention. H. H. Harrison of the Crystal Tissue Company responded.

Winners of the Contests

The F. Andrew Muirhead Golf Memorial Trophy, a silver water pitcher, was won by Bunn Beasley of the Brown Paper Mill of Monroe, La., whose score was 79. Mr. Beasley received a leatner golf bag in addition to the custody of the trophy. Other winners in the superintendents low gross contest were Mr. W. Johnson, 83, E. R. Neblett, 84, C. J. Ludwig and C. P. Ludington, 88. The winners in the low net match were E. J. McDonnell and R. W. Meyer, 71. T. Imbleau and C. E. Stokes, 73, F. L. Zeller and H. Kruse, 74, J. M. Stephenson, John Kennedy and Fred Doutt, 79. Mr. Griffiths of Heller & Merz and C. P. Ludington of the E. B. Eddy Company were tied in the contest for the nearest drive for the pin, as Mr. Ludington had won one of the low gross prizes, Mr. Griffiths was given this prize. The award for the longest drive on the 16th hole was won by E. Peterson of the B. F. Goodrich Company. L. P. Taylor of the American Writing Paper Company won the prize for turning in the high gross score in the superintendents group. His score was 140. Robert Zellers won the prize for the lowest gross score in the salesman and guest division.

Other Winners

Other winners in this division were Samuel R. Anderson of the Harker Electrochemical Company, A. Spencer Brown of the Appleton Woolen Mills, Fred Schneider of the Hampden Color and Chemical Company, Henry F. Bigelow of the Weyerhaeuser Timber Company, Curry Watson, H. W. Sherman of the Northern Paper Mills, C. L. Bachelder of the Hercules Power Company, Chas. W. Beauchamp of the Link Belt Company, A. F. Bailey of the du Pont Company, D. Blanchard of the Magnus Chemical Company, J. H. Dow of the Castle and Overton, and A. P. Knaus.

The entertainment was provided by three wrestling bouts featuring a bout between two women, and dancing, which lasted until everyone had gone home.

Thursday Morning Session

Thursday morning the convention got down to business and the general chairman, Mr. Gordon

Booth of the Rob't Gair Company, New London, Conn. called the meeting to order and turned it over to National President Frank J. Timmerman of the Northern Paper Mills, Green Bay, Wis. Rev. John H. Nolan gave the invocation. The national secretary, R. L. Eminger, announced that next year's meeting would be held June 22-24 at the Royal York Hotel, Toronto, Ont., and also announced that A. L. Cassie and David S. Wallace had died since the previous meeting at Grand Rapids. The Rev. Mr. Nolan led the meeting in prayer for these two members. President Frank K. Timmerman then addressed the group as follows:

Address of the President

A year ago, at Grand Rapids, you elected me your president. This honor is a singular one. To be chosen as leader of the group of men who direct the manufacturing of paper all over this country is a distinction of which any man may well be proud. I appreciate the confidence you have placed in me, and I want to assure you that it has been a pleasure to serve in this capacity.

The past year has been a busy one. The upswing in business, coming, as it did, after the long and severe depression, brought many problems to the papermill superintendent. Nearly every mill in the country has added something new to its equipment during the past year, and with orders increasing and deliveries rushed there seemed little time for anything except production. Yet in this busy time, your association has made remarkable progress. Since our Grand Rapids Convention we have added 107 new members to our roster; we have carefully considered the Field Secretary's report and adopted seven of the twelve recommendations it contained; we have sent out a set of Instructions outlining a uniform procedure to Divisional chairmen and secretary-treasurers; a better understanding of our aims and purposes is being established among mill executives; a plan for including local as well as national advertisers in our Year Book has been developed and put into effect; effort has been made to make divisional meetings more constructive, to relieve divisional officers of as much work as possible, and to provide individual members with more information than ever before; Bob Eminger states that our Year Book advertising is way ahead of last year; and, to cap the climax, your National Convention Committee has put on a Paper Progress Exhibit which is the largest exhibit of its kind ever staged.

F. L. ZELLERS
First Vice president

These achievements are not mine; they are not the achievements of any one man; they represent the combined efforts of many men, trustees, committees and individual members, all of whom are interested in the welfare of our association. This cooperation, this joining together of forces with which to work for the common good, perhaps represents our greatest achievement. Cooperation in our own association as well as cooperation in our individual mills, is the keystone which unites our efforts into the solid masonry of accomplishment and enables our association to take its proper place among the constructive forces in the paper industry.

Two years ago, at Richmond, Va., you voted to uphold the trustees in their determination to give to the membership a greater service than had ever been given before. Last year at Grand Rapids, you were informed that a start had been made in this direction, that, among other things, a field secretary had been appointed to assist in carrying out this program, and

B. D. MILLIDGE
President

H. H. HARRISON
Second Vice president

that the secretary-treasurer would now have more time to devote to his special duties. You now, naturally want to know what has been accomplished. In considering the results obtained to date, please remember that much of the past year has been spent in preparing for progress, and that the actual work of building for increased service has but started. As your trustees have endeavored to build solidly no attempt has been made to act hastily or to merely make a showing, but each move has been deliberated and action taken only when we were convinced that it was for the good of the whole membership.

As stated before, the field secretary's report, based on a three months' survey, contained twelve recommendations, of which seven have been approved and adopted, either in their original, or in a modified form. These seven recommendations are as follows:

1-A—THE FIELD SECRETARY SHALL ASSIST DIVISIONAL OFFICERS IN ARRANGING HELPFUL MEETINGS.

This recommendation has been taken care of in part by the set of instructions sent to divisional officers, and in part by the work of the field secretary in assembling and sending out a list of helpful features of each divisional meeting to all divisional chairmen. In accordance with instructions the field secretary has attended meetings, both Spring and Fall, of all divisions except the Pacific Coast.

1-B—THE FIELD SECRETARY SHALL ASSIST IN PUTTING ON THE NATIONAL CONVENTION.

Those of us who have acted as your National Convention Chairmen know that the work involved is so great that it often interferes with one's mill duties to the point where he must neglect either his duties to his employer or his duties to the convention. For this reason, our field secretary has been given the responsibilities of our 1938 National Convention, his decisions will be subject to the approval of a special committee of three, appointed by the incoming president. This committee is to be known as the Convention Advisory Committee. This arrangement is to be tried out for one year.

2—A LIST OF NON-MEMBER SUPERINTENDENTS SHALL BE PREPARED.

This list has been prepared. In connection with its preparation E. T. A. Coughlin has given much of his time and deserves much praise. We now have a larger and more complete list of non-member superintendents than ever before. This list we plan to use for advertising, and for other Association purposes.

R. L. EMINGER
Secretary-Treasurer

3—BOOKS OF INTEREST TO SUPERINTENDENTS.

In cooperation with a large publishing house, a list of books on paper-making and allied subjects has been sent to our entire membership.

4—INFORMATION AS TO HOW SUPERINTENDENTS' CONVENTIONS CAN HELP PAPER MILLS.

Our field secretary has been instructed to collect information concerning the help which members of this Association have received at Conventions. This has been done and definite evidence of large savings to mills has been found. This information has been effectively used in a number of instances.

5—OPEN HOUSE ENTERTAINMENT AT CONVENTIONS.

The following request has been adopted by your trustees and will be printed in the 1938 Year Book:

REQUEST

"The Board of Trustees of the American Pulp and Paper Mill Superintendents Association requests that

A. B. C. DREW
Third Vice president

OSCAR STAMETS
Fourth Vice president

at both National and Divisional meetings its members or guests do not permit their rooms to remain open for entertainment purposes during the time scheduled for general or group meetings, and asks the cooperation of all in their prompt and regular attendance at all business sessions."

6—FULL-TIME STENOGRAPHER FOR CENTRAL OFFICE.

While a full-time stenographer for the Central Office was not approved an increased appropriation for stenographic service was placed in the budget. This was a wise provision because our Central Office work has increased materially this year.

7—ADVERTISING.

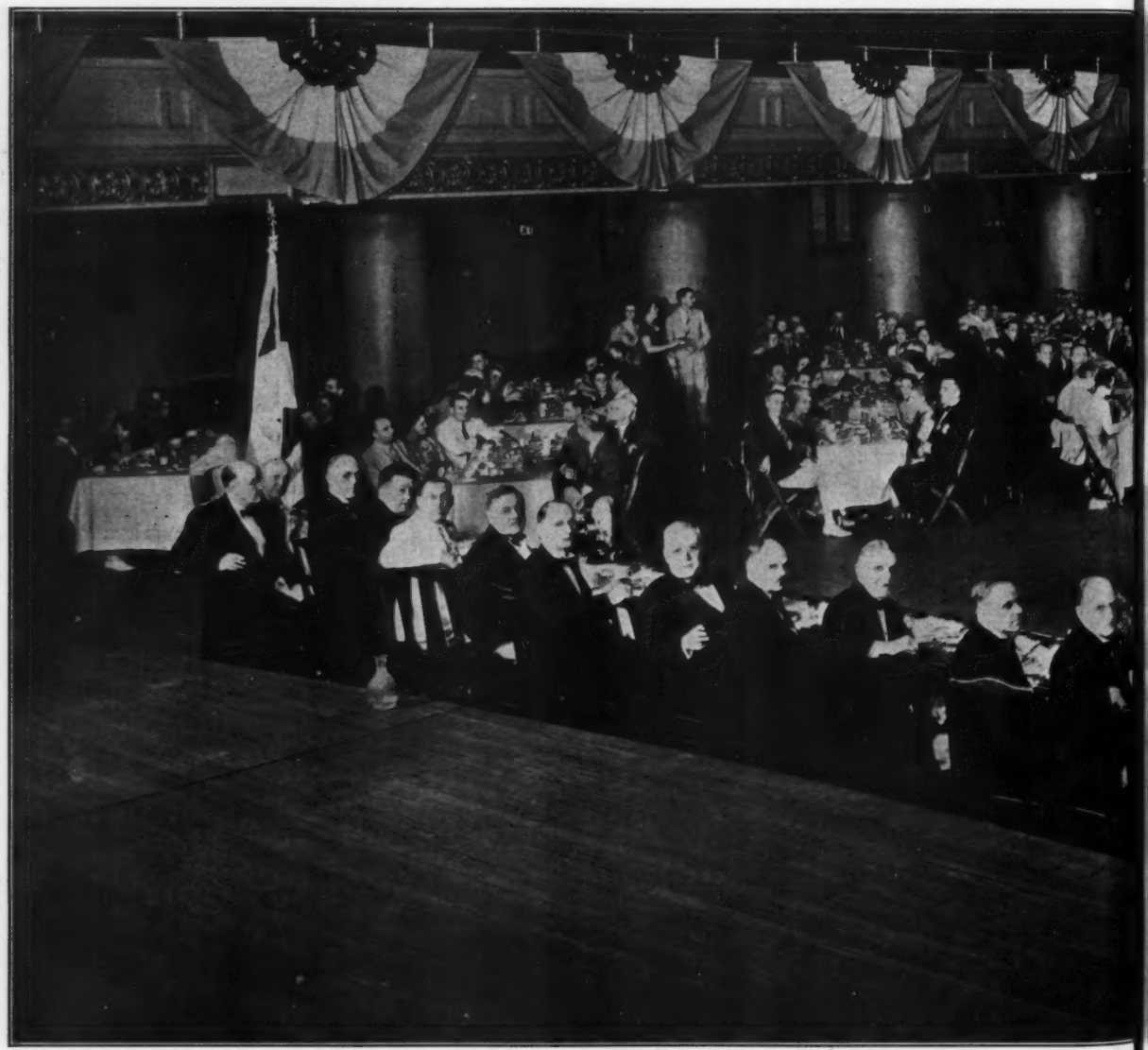
Two hundred and forty-seven Year Books were sent out in February to officials in mills where we had no members. Much favorable comment has resulted from this move, and a goodly number of new members were added in consequence of it.

During this past year your president has had the assistance of a committee of three trustees which was originally organized to outline the duties of the field secretary. This committee proved to be so valuable that it became the president's advisory committee and a similar committee has been appointed from the trustees for the coming year.

During the past year it became evident that there was a definite interest in our association among the superintendents in mills in the South. A start was made toward reorganizing the Southern Division, and if our plans go through as projected, we will soon be able to number the Southern Division among our active branches.

I have made no attempt to list all the accomplishments of the past year, but the above will give you some idea of the scope of the work we have done, and of what we may expect from the association when these ideas are more fully developed.

As this is but a beginning, and as new ideas will be added from time to time, you may see that our association is forging ahead. I expect big things of the Superintendents Association. We want to make it so worthwhile that no pulp or paper mill superin-



PICTURE TAKEN AT THE EIGHTEENTH ANNUAL CONVENTION OF THE AMERICAN P AND

tendent can afford not to be a member of it. This can be done if every member will boost the association, not only with words, but with deeds, by making himself as helpful to every other member as he wants every other member to be helpful to him. If this is done we will have an organization which will not only be invaluable to individual members, but to the industry as a whole. This is my ambition for the Superintendents Association. This is my hope for its future.

At this time I wish to thank our official organ, The *Paper Mill and Wood Pulp News*, and all the other trade publications which have assisted us during my term of office, for the splendid cooperation given to our association.

In closing let me thank each and every member who has helped me during the past year; without this help I could have done nothing. I thank you for the opportunity which you gave me to serve as your president, and I ask that you all join with me in pledging 100 per cent support to our Association for the coming year.

Following the address of Mr. Timmerman there was an excellent sound motion picture presented by the Albany Felt Company entitled the "Art of Felt Making," the narrator being Lowell Thomas. The picture was very well received by the meeting, and at its conclusion a general discussion of mill problems was led by past president John H. O'Connell. It soon evolved into a discussion of felt problems and many questions were fired at Mr. Standish of the Albany Felt Company, who endeavored to give satisfaction to everyone.

The speaker at the Thursday luncheon was Edward E. Whiting of the *Boston Herald* who discussed "Who Loves Business?" Mr. Whiting was introduced by James B. Ramage of the Franklin Paper Company, Holyoke.

After luncheon the superintendents attended the various group meetings. They were as follows: Book

AND PAPER MILL SUPERINTENDENTS ASSOCIATION, SPRINGFIELD, MASS., JUNE 23-25, 1937.

and Fine Writing Division, Chas. Champion, chairman; Board Division, John Brougham, chairman; Sulphite Soda Pulp Division, John McCrystle, chairman; Sulphite Division, Morris F. Heddon, chairman; Tissue Division, H. H. Harrison, chairman; and Ground Wood Division, Sidney D. Wells, chairman. Unfortunately some of these meetings were very poorly attended. There were many very worthwhile papers presented, and it is unfortunate that so little interest was shown. Most of these papers will be found in the Technical Section of this issue of the PAPER TRADE JOURNAL.

An Enjoyable Banquet

Thursday evening dinner was again held in the banquet hall of the Industrial Arts Building and Eli Lucas acted as master of ceremonies. There were no speeches to interrupt the variety show which seemed to amuse the diners. After the show dancing was again enjoyed until the last couple was ready to go home.

Friday Morning Session

Friday morning the general meeting was again called to order by President Timmerman. The following subjects were discussed at this meeting: "Cost Engineering," by Dr. J. P. Hagenauer of the American Paper and Pulp Association; an excellent motion picture was presented by J. W. Hemphill of Johns-Manville, illustrating heat; Morris Kantraivitz and Mr. R. H. Simmons from the U. S. Government Printing Office discussed "Evaluating the Printing Qualities of Paper"; R. L. Wickes of the American Leather Belting Association discussed "Modern Mechanical Drive for Paper Machines."

Harry Newton Clarke Speaks

The meeting was adjourned for luncheon and at the luncheon L. M. Yoerg, president of the American Writing Paper Corporation, introduced the famous guest speaker, Harry Newton Clarke, who held the large audience spellbound with his thought provoking talk on "Men, Money, Management, and Misunderstandings." Mr. Clarke condensed a long and involved subject into a short hour's talk. After he concluded he invited anyone who wished to discuss the subject with him privately in an old fashioned bull session, and many of the listeners availed themselves of this privilege.

After luncheon the general meeting was continued.

Election of Officers

The first item of business taken up was the election of officers which resulted as follows:

President, B. D. Millidge, Howard Smith Paper Mills, Ltd.; First Vice-president, F. L. Zellers, French Paper Company; Second Vice-president, H. H. Harrison, Crystal Tissue Company; Third Vice-president, A. B. C. Drew, The Pairpoint Corporation; Fourth Vice-president, Oscar Stamets, Riegel Paper Corporation; Fifth Vice-president, Grover Keeth, Marathon Paper Mills Company; Secretary-treasurer, R. L. Eminger, and Field Secretary, Geo. W. Craigie.

Committees Make Report

After the election of officers reports of the auditing committee and the committee on resolutions were read and accepted. The subject of "Progressive Forces in the Paper Industry" was discussed then by G. R. Wallace, president of the Fitchburg Paper Company, and "The Proper Use of Gear Motors and Speed Reducers by the Paper Industry," by R. S. Marthens of the Westinghouse Electric and Manufacturing Company. A motion picture entitled "Color," was presented by the Heller & Merz Division of the Calco Chemical Company. The meeting was adjourned and the official part of the convention was ended.

Annual Banquet

That evening the scene of activities was removed to the Municipal Auditorium in Springfield where the annual banquet was held. The guests were entertained by Alice Browne Smith of Holyoke at the Organ. Judge William J. Granfield of Springfield acted as toastmaster. The speakers were his excellency Gov. Chas. F. Hurley, Hon. Henry Martens, mayor of Springfield, Hon. Wm. P. Yoerg, mayor of Holyoke, and D. Clark Everest, president of the American Paper and Pulp Association. The L. D. Post Trophy, a Hamilton gold watch, was awarded to the retiring national president, Frank J. Timmerman. The various door prizes and lottery prizes were awarded also. After this more formal phase of the banquet the throng settled down to enjoy the excellent entertainment and dancing.

Interesting Program for Ladies

The ladies in attendance at the convention had an interesting program laid out for them. On Wednesday they registered and inspected the old Colonial Village, known as Storrowton, located on the Eastern States Exposition Grounds.

That evening they attended the Clam Bake and enjoyed the dancing afterwards.

On Thursday and Friday some of them spent the morning inspecting the Springfield Art Museum Center, ate luncheon at the Pecoasic Villa in Forest Park, and afterwards toured the city. Others had an opportunity of going on the college tour, visiting various well known women's colleges in that vicinity and eating lunch in Wiggin's Old Tavern in North Hampton.

On Thursday evening again was a dinner and dancing in the Industrial Arts Building, and Friday evening they attended the annual banquet in the Municipal Auditorium.

The several informal bridge tournaments were enjoyed by the women guests and many availed themselves of the opportunity of using the Springfield Country Club golf course.

Exhibition Is Outstanding Feature

The exhibition of machinery and equipment was the outstanding feature in the whole convention. Most of the exhibitors had samples of their products on display ranging from pulp stones, rotary and flat screens, pulpers, beaters, jordans, down to fittings, instruments and laboratory equipment. Most of the booths were very well attended, and many of the exhibitors reported numerous actual orders and contacts that they felt certain would lead to orders were made.

Description of the Exhibits

A brief description of the exhibits will be found on other pages of this issue of the PAPER TRADE JOURNAL.

Pulp and Paper Machinery and Supply Firms Exhibit at Springfield, Mass.

The following were among the pulp and paper machinery manufacturers and supply concerns who made exhibits at the Paper Progress Exposition held in connection with the eighteenth annual convention of the American Pulp and Paper Trade Superintendents Association, at Springfield, Mass., June 23-25.

Acorn Refining Co.

Acorn Refining Company presented a display of demonstrating samples, showing uses of various Acorn products as protective finishes in Paper Mills. These include CMC Metallic Coating, made from a special metallic alloy and vehicle and not to be confused with aluminum paint. This provides great protection to equipment under the exacting conditions encountered in a paper mill. Insola is a special combination of red lead and graphite recommended as a priming coat under CMC Metallic Coating. Superbrite Aluminum Paint is recommended for exterior of buildings and other general uses. There were demonstrating samples also of Duroplastic Calking Compound, Acolite Machinery Enamel and Nuroof Liquid Asbestos Roof Coating. In attendance at the booth were Harry Heyman of New York; S. C. Barton of Springfield and E. J. Sullivan of Cleveland.

American Brass Co.

A representative line of brass and copper fittings for the seamless copper tubes, which in smaller sizes are used for water, and in larger sizes for conveying stock, was exhibited by the American Brass Co. Emphasis was placed on the solder type of fitting. A screen plate made of phosphor bronze, wires, and wire cloth made of brass and phosphor bronze were shown.

The display included sheet and rod everdur with examples of ducts and structural shapes built up by welding. There were also machine bolts and wood screws suitable for fastening flat screens, six varieties of welding rods for electric and gas welding cast iron, steel, copper, everdur and the bronzes, examples of condenser and heat exchanger tubes in six alloys with samples of the extruded rolled and drawn intermediate sizes in a nickel bearing metal.

The novelty of the exhibit was the display of Beryllium copper recently developed heat treated alloy of high tensile strength.

Baldwin Belting & Leather Co.

Baldwin Belting and Leather Company, Inc., featured its Frictionized belting. Frictionized belting is a development of the Baldwin research laboratory to give the leather belt extremely high transmission capacity with minimum stretch. This belting was in actual operation under the following adverse conditions: oil, water, heat, high speed, and severe bending. Another feature is a transmission testing machine, which subjects the belt to exactly the same conditions which are encountered in the field. This testing equipment was built by Baldwin Belting and Leather Company, Inc., and is an exclusive design. Other testing equipment and the special process used in the manufacture of Frictionized leather belting were described. In attendance at the Baldwin booth were Preston de G. Baldwin, Alex Blakley and George Keesee.

Baldwin-Duckworth Chain Corp.

The main piece of the Baldwin-Duckworth Chain Corporation's exhibit was a moving display whereon were mounted all the various standard sizes of machine finished roller chain operating over cut tooth sprockets. These chain drives are operated by a low horse power motor into the smallest chain on display, each drive increasing in pitch up to the largest drive which will be of 4 inch pitch chain. The company also had a standard display board which gives a comprehensive idea of the entire range of material manufactured. The exhibition was in charge of E. L. Parsons and the following: F. T. Lange and Malcolm M. McCulloch, sales engineers; G. D. Gilbert, sales manager; and J. F. McCann, chief engineer.

Barkon-Frink Tube Lighting Corp.

Barkon-Frink Tube Lighting Corporation exhibited the new Barkon Carbon Dioxide Daylight lamps now creating considerable interest in the paper and pulp industry. Three of the standard models were shown as well as a new portable model. In attendance at this booth were Frank McGinnis, president and Dr. T. J. Killian, director of research of the Barkon Tube Lighting Corporation of Seattle.

Barrett-Craven Company

The Barrett-Craven Company exhibited one of their motor operated platform lift trucks. It is designed for double deck skids of paper and the capacity of this type portable elevator is from 500 to 5,000 pounds. Also exhibited was a small hand truck designed for moving one skid about the mill or warehouse.

Bauer Bros. Co.

The Bauer Brothers Company exhibit featured the Bauer pulper. Visitors saw samples of stock before and after going through the pulper, and results of the pulper's work on shivey pine kraft, steamed southern pine, southern pine sulphite pulp, straw and kraft old corrugated box stock, and a variety of other kraft, sulphite and groundwood screening. The pulper will make pulp out of any fibrous substance and as a stock treating machine can be used to make almost any product out of pulp. Kraft knotter rejects were reduced to a point where they passed through a .008 cut screen at a power consumption of 20 h.p. per ton. The same comparison was shown with cooked and blown semi-chemical black gum wood chips. In addition to the pulper, the McNett Fibre Classifier was displayed. This gives the percentage of different sized fibers in a sample of stock.

Beloit Iron Works

Beloit Iron Works, Beloit, Wis., exhibited pictures

of various Beloit suction drum press installations on board machines and also pictures of various Beloit horizontal dual presses on Fourdrinier machines. The company also had a picture showing a new felt arrangement on board machines incorporating the suction drum press and plain primary presses above the vats using a short top felt. The company also had short motion pictures showing this new installation of the short top felt arrangement on a board machine in operation and also a motion picture showing the Beloit horizontal dual press in operation and the operation of threading the sheet through the press. The company ran these motion pictures at various times during the day to suit the convenience of those who wished to see the pictures.

Better Packages Inc.

Better Packages Incorporated showed their two latest, improved types of flat paper packing and sealing machines in actual operation. One machine is for sealing cartons of flat paper while the carton and the paper are under pressure so as to squeeze air out from in between the sheets of paper. The other machine is for the new bundles where very wide (10 or 12 inches wide) sealing tape is used for making bundles of coarse, flat papers and boards. Many mills have used this equipment for quite some time. It gives solid, compactly sealed boxes, which reach the paper dealer in beautiful condition and help the sale of the paper. It also eliminates the breaking of cartons when in transit and when piled on top of each other. The sticking of the gummed tape is unusually efficient, the moistening unit having a micrometer control. Both machines automatically locate the sealing tape very accurately all the way around the four sides of the box, insuring an air tight, perfectly aligned seal. Other models of interest were the Box Makers' Automatic Electric Sealer. This machine feeds continuous strips of paper or cloth tape, measured, moistened and cut off at any speed desired. For ream sealing, machines that feed 2, 3 or 4 strips of narrow tape with each feed stroke are a great saving in labor. All these sealers have Counterboy's Automatic Moistening Control, the result of 26 years experience building the finest type of sealing equipment.

Bird Machine Co.

The newest model Bird 3A Screen with dual drive was shown in operation. The latest model Bird Triple Treatment Centrifiner was also running. The Bird Save-All with all modern improvements was demonstrated, also as it actually runs. A Vickery Felt Conditioner was available for inspection, complete with piping, gauges and auxiliary equipment so that paper makers could see exactly how it may be installed and operated in their mills. A very interesting and comprehensive display of Vickery Doctors was installed showing the application to every type of paper machine, calender and supercalender roll. The latest design of Bird Self Cleaning Shower Pipes was also available for inspection. Some or all of the following sales and engineering

PICTURE TAKEN AT BANQUET OF EXHIBITORS AT PAPER PROGRESS EXHIBIT AT CONVENTION OF AM PUL

personnel of Bird Machine Company was in attendance at the exhibit to demonstrate these machines and answer questions with regard to their installation and operation under all varieties of working conditions: Messrs. Dennett, Becker, Ingraham, Frothingham, Smith, Warren, Zeeland, and Forsyth.

Boiler Equipment Trust

Boiler Equipment Trust, North Amherst, Mass., exhibited a model of a horizontal return tubular boiler built on a scale of ⅛ inch equals 1 inch. This boiler was fully equipped with a working model of the B. E. T. boiler tube cleaner operated with compressed air. The model of the boiler is so arranged that doors may be opened in the rear and the action and effect of the cleaner observed while it is in operation. The company also displayed a frame of testimonial letters received from a large number of paper mills around the country.

Bristol Co.

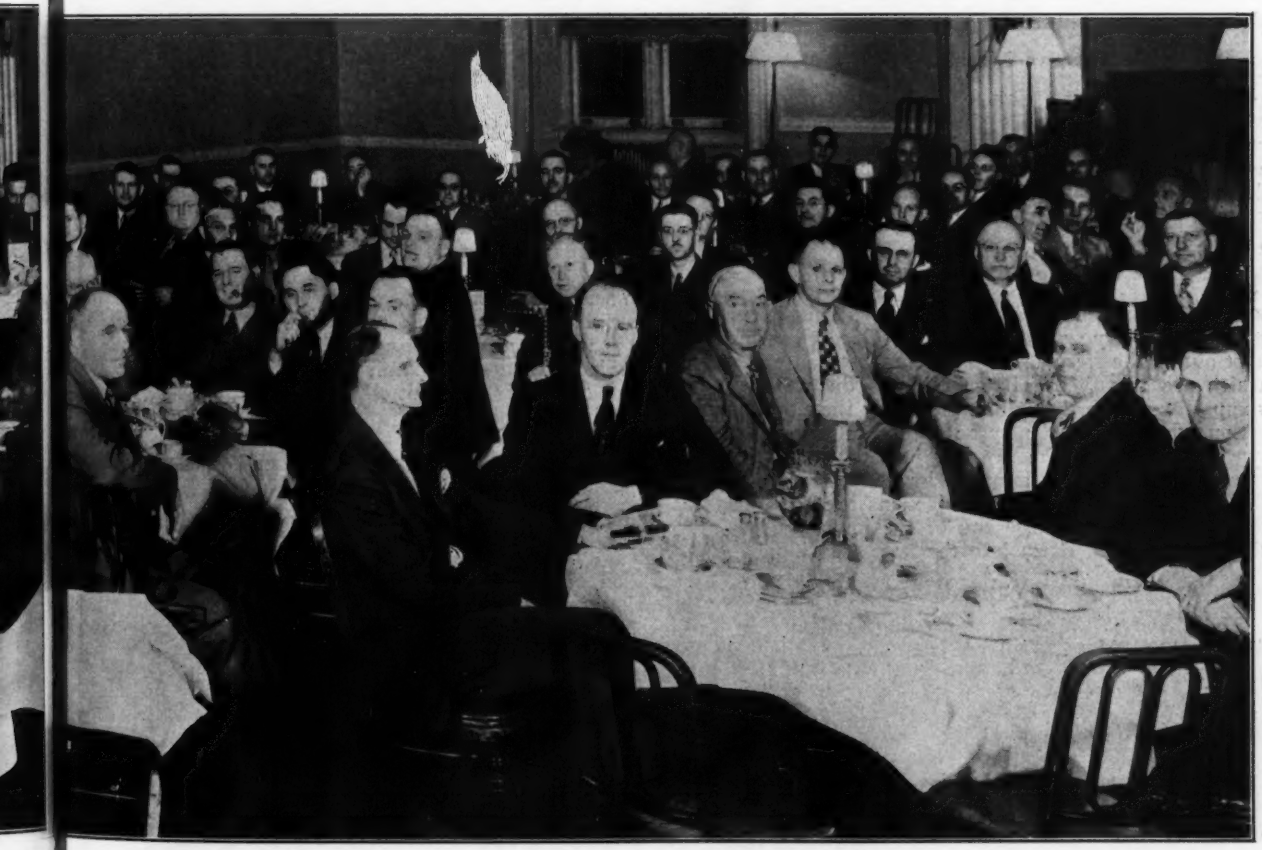
Bristol's Coordinated Process Control, a new development, to set equally new standards for cost and quality in automatic process control was featured at this exhibit. The Mechanical Man symbolizes the fact that with this system the operation of valves and electrical equipment in plant processes are closely controlled to conform to a set schedule of operations. The multiple-cam cycle controller is the brain of this system, which eliminates the human element in processing. Thus, in involved scientific processes, temperature pressure, humidity, liquid level, flow, operation recording and machine speeds — all closely related to the pulp and paper industry — are placed under complete automatic control. The Bristol Company exhibited instruments to control and record individual operations in the mill. These include the following: The New Pyromaster for use as a Tachometer or Potentiometer. Temperature Recorder. An Air-Operated Time-Temperature Controller. The New Electric Integrating Flow Meter. Bristol's Wide-Strip Resistance Thermometer. A Mercury-Contact Pressure Controller. Portable Instruments for temperature, humidity and electrical recordings. Bristol's Mill Supply Line: Socket Set Screws, Socket Head Cap Screws, Belt Lacing and Belt Plates.

In attendance were: H. L. Griggs, vice-president and sales director; H. E. Beane, field sales manager; E. R. Wyatt, manager sales engineering department; C. Webber, New York district manager; F. W. Borchers, Philadelphia district manager; J. L. Williams, Boston district manager; F. J. Reynolds, sales engineer and G. P. Lonergan, sales promotion department.

A. E. Broughton & Co.

A. E. Broughton & Co. made rather an extensive exhibit of their various systems for paper and board machines. These included the following:

The new Broughton Unit Vacuum Control System for controlling the vacuums of the flat boxes on paper machines under which there is no basement, or where it is impossible or impractical to install drop



PULP AND PAPER MILL SUPERINTENDENTS ASSOCIATION, SPRINGFIELD, MASS., JUNE 23-25, 1937.

legs. The Broughton Pump and Metering Unit, for handling the condensate from the Broughton Drainage System. This Unit will pump water at any temperature without the use of any cooling water whatsoever. The new Broughton Oscillator, for oscillating dryer doctors, press roll doctors, showers, flat boxes, etc. The Broughton Fuzz and Dirt Collector System, for removing dirt, fuzz and scale from the first wet end dryer.

Brown Instrument-Minneapolis-Honeywell

The Brown Instrument - Minneapolis - Honeywell display illustrated the latest developments in instruments and automatic control equipment applicable to all phases of the paper industry: Air Conditioning— Recording and automatic control instruments. Black Liquor — Area flow meters for measuring viscous liquids. Boiler House — Instruments for efficient steam generation. Digester — Instruments for indicating, recording, steam flow, temperature, pressure. Dryer — Control systems, indicating and recording instruments. Flow Meters — Electrical and mechanical meters for measuring steam, liquids and gases. Liquid Level — Instruments for indicating, recording and controlling levels of acids, stock, water. Pressure — Instruments for recording, indicating and controlling. Speed — Tachometers for indicating and recording paper and machine speeds. Temperature — Recording and controlling instruments for low and high temperatures. Valves—Air and electrically operated valves for all applications. Of special interest is the Air-o-Line system of control which is adaptable to all types of automatic control applications.

Cameron Machine Co.

Cameron Machine Company, Brooklyn, N. Y., made an exhibit of rolls slit on Camachines, also certain pictures of Mill Type Winders as well as an actual machine showing new automatic web tension device. J. B. Venturini, New England sales representative, and H. E. Overacker, advertising manager, attended the show.

Carthage Machine Co.

The Carthage Machine Company exhibited one of its new rotary type chip screens. Good chips are kept out of the rejected chips by means of an apron which prevents their falling back into the rejection compartment after being brought up by the agitating action. Higher speed may be used than with older types, thus getting the sawdust into the air. The sawdust may then be removed by a suction fan if the screen is covered. The rejections are crowded together at the discharge end of the inner cone so they will not fall down into the accepted chips.

Chapman Valve Mfg. Co.

The Chapman Valve Manufacturing Company, Indian Orchard, Mass., displayed iron, bronze and steel valves, such as are used in paper and pulp mill service, also the Chapman Valve Motor Unit for the electrical operation of valves, sluice gates and floorstands were displayed.

Cheney Bigelow Wire Works

The Cheney Bigelow Wire Works used its booth for an extremely novel feature. The entire space was given over to a personal service rather than to the display or advertising of the products of the company. A complete information bureau was maintained at which road maps, time tables, bus schedules and the like could be obtained.

Chromium Corp. of America

Chromium Corporation of America exhibited both sample and full size pieces of various pulp and paper mill equipment, chromium-plated by the Crodon process. This included a small assembly section of curved slice and making board, conventional and "open-back" flat screen plates as well as various types of rolls. A new and heavier type of curved screen plate with the back relieved and the slots tapered to provide additional strength was introduced. It is claimed that although the slots on this plate are somewhat shortened, there is no loss of screening capacity. Also on display was a Crodon-plated flat screen plate, especially designed for screening kraft, which has met with considerable success because of its ability to screen long-fibered stock without clogging the slots. New developments of interest included an open-grain press roll used successfully in either first or second press positions on short-fibered or clay-filled stock and also on groundwood or sulphite, without sticking or pulling of fibers. Applications of industrial chromium plating to various types of paper mill equipment were illustrated and explained by company representatives. E. R. Granger will be in charge of this exhibit.

Clinton Co.

The Clinton Company did not present any of its products. The booth was open at all times as a visiting spot for any superintendent.

Continental Diamond Fibre Co.

The Continental Diamond Fibre Company displayed a representative group of its Dilecto products, a laminated plastic, developed to eliminate the problems of corrosion and wear in the paper industry. It has a base of either paper or fabric held together with phenolformaldehyde varnishes. It gives a very hard, dense material with a low coefficient of friction. Pipes and fittings made of Dilecto are highly resistant to acid, alum, size and bleach solutions.

On exhibit were a table roll which had run for three years and a suction box cover which had been in service twenty-one months, making 13,000,000 pounds of paper without showing any damage. Doctor blades and line of pipe fittings were also exhibited.

Various stock car and other hand truck bodies are also made of Dilecto.

Hyatt Bearings Div., General Motors Corp.

Hyatt Bearings Division, General Motors Corporation, showed the extensive use of Hyatt Roller Bearings in pulp and paper machinery. In attendance at the booth of this concern was F. U. Naughton, Jr., New England sales engineer, L. C. Fisk, sales engineer, Newark, and J. M. Grady, divisional engineer from headquarters.

Corn Products Sales Co.

Corn Products Sales Company arranged Booth No. 55 as a resting place for Superintendents at the Paper Progress Exposition. In attendance at this booth were Curry Watson, A. A. Harden, C. L. Logue, J. G. Bullard, Paul Donaghy and C. P. Slocum.

Crane Co.

Crane Company showed a Crane 10 inch Pulp Stock Valve as a feature of its exhibit. This is a very new Crane product and this was the first opportunity for pulp and paper mill executives to get a closeup of the valve. About two car loads of these valves have been installed in one of the large Southern mills and a considerable number have been sold to several other mills throughout the country. These valves have been so satisfactory on pulp stock lines as to produce repeat orders. Among the Crane representatives in attendance at this exhibit were E. P. Abbott, Ward Converse, J. F. Lee, E. T. Rowe and Col. T. H. Ireland.

DeZurik Shower Co.

One of the main features of this exhibit was the DeZurik Stock Consistency and Weight Regulator capable of handling any density from 1¾ per cent to the heaviest which can be pumped. A number of DeZurik Easy Opening Valves were displayed in straight-way, three-way and angle patterns made of both iron and bronze. A full size shower pipe complete with cut-away lump strainer was shown together with a selection of large size spray nozzles such as are used on flat screens, stock washers, pulp grinders, etc. Along with the shower exhibit were several DeZurik Mendham Cleanable trim squirts or Deckle cutters. A section of the exhibit was devoted to displaying samples of pulpwood cleaned on the DeZurik Knot Boring Machine. Blocks of wood were on hand showing the various ingrown defects both before and after cleaning on this machine. There were also samples of rejected material from both knot boring and knot sawing machines illustrating the amount of dirt these machines remove from the pulpwood.

Dilts Machine Works

Dilts Machine Works, Inc., Fulton, N. Y., used a rather elaborate display including their newly developed machines, among them being the Cowles Classifiner, the Hydrafiner, variable pitch propeller, vat pump and propeller type agitators. All of these pieces of equipment have been developed during the last three or four years.

Downingtown Mfg. Co.

The Downingtown Manufacturing Company exhibited a complete suction felt roll. A moving picture showing an extractor roll, suction rolls and suction felt rolls in operation was also featured at the Downingtown exhibit. Photographs of various installations of Downingtown equipment had a prominent place in the display of this company.

Duriron Co., Inc.

The Duriron Company, Inc., Dayton, Ohio, displayed the following equipment: Stainless Steel Castings for use in the sulphite pulp industry, Stainless Steel Valves, Stainless Steel Pumps and Stainless Steel pipe fittings. Durimet (a stainless steel), which is not only highly resistant to sulphite liquors but also to weak sulphuric acid. Durion and Durichlor: Valves, pipe, fittings, ejectors, absorption jets, dissolving jets for dissolving and handling alum; for chlorinating water and other corrosive conditions involved in the bleaching of pulp and paper, and in the manufacture of paper. The following were in attendance: G. A. Baker, Stainless Steel Sales, Dayton, Ohio; C. F. Stanton, District Office Manager, Boston, Mass.; W. H. Scott, General Sales Manager, Dayton, Ohio.

Flexible Steel Lacing Co.

Flexible Steel Lacing Co. displayed Alligator steel belt lacing, Alligator belt cutters, Flexco HD belt fasteners and Flexco and Flexco-Lok guards for electric lamps. H. Irwin Reinhorn was in attendance at this booth.

Foxboro Co.

The Foxboro Company, Foxboro, Mass., featured three instruments: the Verigraph, the Remote Stuff Gate Controller and Pneumatic Loading Controller. In addition to these three, this company also exhibited their standard line of temperature, level, pressure and flow instruments for the paper industry. Some of the featured instruments were arranged so that their operation can be demonstrated. The Verigraph, which normally is used to measure and control the weight of moisture in paper, operated as a hygrometer to show its extreme sensitivity to humidity. The Pneumatic Loading Controller was set up so that visitors can actually weigh themselves pneumatically by adjusting the instrument as they would in operation on a press roll. The following engineers were in charge: M. B. Hall, A. Allen, M. P. Woodason, B. G. Constantine, W. H. Howe, J. H. Collins, G. A. Philbrick, O. R. Prescott, D. R. G. Williams.

France Packing Co.

The France Packing Company exhibited a complete line of metallic packing for use on all types of engines and compressors. This company has been manufacturing metallic packing exclusively for the past 42 years. The booth was taken care of by Owen S. Williams, New England district representative.

Gatke Corp.

Gatke Corporation staged a most attractive exhibit against a background especially designed for the Paper Progress Exposition. The central feature of the exhibit was a Gatke Hydrotex Jordan Bearing, for water lubrication and the exhibit also included Lubritex non-metallic moulded bearings for oil lubrication and Graphitex bearings, which are self lubricated. The display was completed by representative bearings for every major paper mill application, attractively arranged on a series of risers. Other items included a selection of large ring bearings, Gatke Industrial brake blocks and lining, clutch facings, gears and gear stock. In attendance at the Gatke booth was Marsh Hall and W. A. Rankin.

General Electric Co.

A new water tight controller for sectional drive, a gear-motor with the gear case cut away so that the gear train may be observed in operation, a splash-proof motor for paper mill service, a new air circuit breaker with solid silver contacts—these are a few of the equipments which were displayed by the General Electric Company. Visitors had an opportunity to measure accurately for themselves the amount of light which their eyes require for close work or inspection on the new light sensitive recorder. Incidentally, the booth was especially illuminated with

the new combination mercury-Mazda lighting unit which so many industrial plants are now using. A colorful background for the exhibit were of keen interest to superintendents who were seeking reliable, efficient drives for their mills. This background showed some of the most modern drives for paper machines, winders and Jordans, as well as interesting views of top-roll and cylinder-mold drives. The following representatives attended the exposition—J. M. Wade, W. L. Hilfrank, E. L. Richardson, E. A. Hancock, Boston; C. F. McKenney, Springfield; F. J. A. McKittrick, W. W. Cronkhite, Schenectady; L. F. Rodewig, New York; F. E. Winslow, Philadelphia and A. F. Smith, Cincinnati.

L. H. Gilmer Co.

The L. H. Gilmer Company at its display featured its V-Belts and Kable Kord Flat belts and belting. Both of these products are exceptionally well adapted for use on paper mill drives, many of which impose severe and exacting demands upon belting. Gilmer V-belts are pre-tested for stretch under maximum load, to insure matched working lengths. Brute strength, controlled stretch, double jacketed, long-wear construction, are other Gilmer features. They are made in both multiple and fractional horsepower size. Kable Kord Flat belting is built upon a unique design consisting of a power belt plus a contactor belt, giving a "two-belts-in-one" construction. It is liked because of its tight grip and stout resistance to stretch. It is made in both Endless construction and running lengths.

Graton & Knight Co.

Graton & Knight Company included in its display a working demonstration on how research leather belting increases machine speed—produces more units per hour—and results in a new kind of production bonus. In addition to research belting, other industrial products including leather packings, belt cements and dressings, lace leather and round belting were prominently featured.

Heller & Merz

Heller & Merz Division of the Calco Chemical Company, Inc., was a color information bureau, where visiting paper makers were freely given practical information on any color problem they chose to submit. In attendance at the booth were J. H. Loomis, E. L. Puffer, N. A. Billings, L. L. Griffiths, Jr., P. D. Switzer, A. C. Loomis and G. H. Detwiler.

Hermann Mfg. Co.

Hermann Manufacturing Company, Lancaster, Ohio, showed a complete set of pulp testing and sheet making apparatus,—sheet machine, disintegrator, pump, press, drier rings and discs. Models of the Hermann Hercules Type assembled jordan shell filling and refilling plug liner were also displayed. Photographs were shown of the Hermann Improved Claflin Refiner together with interesting operating data for kraft, sulphite pulps and many other kinds of stock. Photographs and prints were displayed of a 150 ton rotary paper duster, in which the rotating cylinder is 8 feet in diameter and 20 feet long.

Hills-McCanna Co.

The Hills-McCanna Company exhibited a complete line of its valves suitable for pulp and paper mills. There were glass lined, rubber lined and lead lined valves for handling corrosive materials, as well as cast iron, steel and brass valves. The rubber lined valves are particularly adaptable for bleach liquor lines. Hill-McCanna valves can be supplied for every service in a paper mill—for sulphite acid, bleach liquor slush pulp, white water lime slurry, size limes, black liquor and paper stock. All the valves of this company are diaphram valves which make them very efficient where any solid in suspension is being moved as there is nothing for the stock to catch on. All sizes are furnished, from one-half inch to twelve inch.

Horton Mfg. Co.

The Horton Manufacturing Company at its exhibit featured; (a) The Horton uniform torque variable speed pulley, which has established an enviable record in various uses in paper mills and kindred industries. It has proved particularly satisfactory as a drive for winders—all types and sizes—from one to one hundred horsepower; (b) The Horton torque compensatory drive, designed so as to automatically regulate the flow of torque to conform with fluctuating demands of driven machines operating under normal load variabilities and (c) The Horton uniform torque brake for back stands and reels.

Rodney Hunt Machine Co.

Rodney Hunt Machine Company featured a display of water power equipment, turbine water wheels, a laboratory test wheel, miscellaneous parts, wood, metal and rubber rolls as well as assorted samples. The water power equipment featured an actual high efficiency turbine typical of those in widespread use among the paper mills of the United States. One such installation paid for itself in less than a year by reducing the mill's outside power bill by more than $1200 per month. The Rodney Hunt exhibit was in charge of Mr. James Ryan and Mr. Walter Malloy.

F. C. Huyck & Sons

F. C. Huyck & Sons, Kenwood Mills, Albany, N. Y., engaged a booth to be used as a resting place for customers and friends.

Ingersoll-Rand Co.

Ingersoll-Rand Company exhibited its pump and compressor equipment. The exhibit included Class EGV heavy duty paper stock pump, Motorpump for light stocks, white water and general service, and Class NT Pump for boiler feeding. The company also exhibited two small air compressors, a Motorblower and an air ejector. Other equipment for paper mills, too large to exhibit, such as surface condensers, barometric condensers, large air compressors, vacuum pumps, Diesel engines and refrigeration equipment, was shown on large photographs.

International Nickel Co.

The International Nickel Company, Inc., 67 Wall Street, New York, brought to the exposition some of the outstanding new developments in the use of Monel on paper mill equipment. Prominent among these are Monel covered steel rolls which were installed on several of the high-speed bag paper machines in new Southern mills. Drier doctor blades of heat treated "K" Monel found superior to hard-

DOWNINGTOWN

RESULT—Repeat Order for a Second Extractor The Suction Drum Press on a large Kraft Cylinder Machine in the South did not prove as efficient as was expected, for the sheet was so wet entering the nip, after passing over the suction area, that heavy weighting was impossible . . . By installing an Extractor Unit in front of the Suction Drum Press, the sheet was dried up sufficiently to permit more weighting and the speed was increased 10% with less steam required for drying . . . A second Extractor Unit will soon be installed to obtain still further benefits. Consult us before you make any wet end changes. The Downingtown Manufacturing Company, Downingtown, Pa.

NEARLY 150 EXTRACTOR UNITS CAN'T BE WRONG

ened steel were on display. A special flat mesh Monel dandy roll cover of "Sinclair" manufacture was shown, and display of samples included Monel save-all trays as constructed by Rice, Barton & Fales, Inc., Monel jordan fillings, perforated rotary screen plate of Monel, evaporator tubes, "K" Monel ash ejector, and other miscellaneous uses. Various nickel-chrome steel and cast iron applications were also shown. New literature on Monel wire cloth and winding wire, Monel covered rolls for paper machinery were distributed. The attendants at the booth were F. L. LaQue, E. A. Turner, T. E. Lagerstrom, of the International Nickel Company; C. D. Grover of Whitehead Metal Products Company, New York; and S. H. French, H. P. Tucker, D. W. Whitehead, J. M. Brandt, of the Whitehead Metal Products Company, Cambridge, Mass. branch.

Johns-Manville

The theme of the Johns-Manville exhibit was the emphasizing of J-M Service to the pulp and paper industry. The center of interest was a revolving turntable showing crude asbestos rock as it appears when mined. Asbestos fibre was shown along with it and through the medium of individual steps the company showed the progress in manufacturing packings through to the finished product. J-M Service featured J-M Insulations, Refractory Cements, Friction Materials, Roofings, and other materials that are used particularly in the maintenance of paper mill operations. There was also a small exhibit of Superfloss material which is used to some extent for pitch control. J. W. Hemphill, staff manager, pulp and paper industry, Harry Larison, superintendent, Paper Mills, Manville; E. W. Rembert, research laboratory, Manville; C. J. O'Neil, celite pitch control, C. T. Dearborn, manager, Boston office; D. C. Crosby and T. A. DeMarco, Worcester representatives, were in charge.

E. D. Jones & Sons Co.

E. D. Jones & Sons Company occupied Booth No. 158 as the point of assembly from which visiting Superintendents were taken to a paper mill less than ten minutes away to inspect a 1000 pound Jones Bertram Patent Beater in operation. In attendance at the booth were S. H. Jones, H. H. Williams, C. H. Vickery, B. W. Dean and G. H. Spencer.

Samuel M. Langston Co.

Samuel M. Langston Company displayed large photographs of the Langston slitters and rewinders together with samples of paper rolls made on Langston equipment. In attendance at the Langston booth were Bryant W. Langston and Harry Goldberg.

Link-Belt Co.

The Link-Belt Roto-Louvre Drier was displayed in the form of a scene-in-action unit which portrayed the movement of the drum and the flow of the material and gases through the unit. A Link-Belt motorized P.I.V. and worm gear reducer were on display and arranged for operation. Two panels of installation photographs of Link-Belt conveyors and driving equipment in pulp and paper plants formed part of the decorative section of the booth. Two panels of non-operating silent and roller chain drives, showing typical layouts, were prominently placed in the exhibit. A complete line of Link-Belt conveying and power transmission chains used by the industry were shown in the form of samples. Popular sizes of anti-friction pillow blocks, babbitted bearings, take-ups and couplings were shown. Ample literature on all products displayed was available at the booth, including the famous Link-Belt carrying envelopes. The following Link-Belt men were in attendance: Winn Willard, Boston; T. F. Webster, Boston; C. W. Beauchamp, Boston; G. H. Unruh, Philadelphia; and other Link-Belt eastern sales representatives.

Magnus Chemical Co.

In its exhibit, Magnus Chemical Company displayed a complete line of products for paper mill operations. Included in these were such operations as slime removal, cleaning of machines, felt conditioning, cleaning suction press rolls, washing of felts, etc., and in addition products for use in sizing and beater assistance. All of these products have been designed particularly to meet the cleaning operations encountered in the paper mill field. The Magnus booth was attended by D. Blanchard, vice-president in charge of sales; C. S. Foster, Springfield, representative; A. T. McCurdy, Worcester representative; L. C. Bowering, Boston representative; H. D. Breivogel, Providence representative; and R. G. Campbell, Hartford representative.

Mason-Neilan Regulator Co.

Mason-Neilan Regulator Company's exhibit consisted mainly of its demonstration truck—a laboratory on wheels—which is constantly touring the country demonstrating the merits and applications of Masoneilan control equipment to plant engineers, operating men and maintenance men. So far this truck has traveled over 30,000 miles in nearly every state in the Union. Equipment of particular interest to the paper industry was demonstrated.

Merrimac Chemical Co.

Merrimac Chemical Company's exhibit was a very simple one with a large card listing various chemicals manufactured for paper making and for water treatment. The following represented the company at the convention: H. S. Leonard, F. A. Abbiati, L. P. Kelley and L. F. Loutrel, Jr.

Midwest-Fulton Machine Co.

At the booth of the Midwest-Fulton Machine Co. pictures of the Fulton condensate systems and Midwest pulpers and beaters were shown, in addition to a large number of plans of various paper mills illustrating how the Midwest-Fulton Equipment fitted into the general layout. A series of charts were exhibited showing the effects that should result from the use of the Fulton forced vapor circulating systems, along with the plan and pictures of the drainage system installed at the new Crossett Lumber Company mill. The Midwest-Fulton Machine Company offers a complete engineering service to paper and pulp mills.

Morris Machine Works

Morris Machine Works featured a 1-inch model pump with glass pipe line, in operation, handling 3½ per cent stock. In experimental work this model has been successful in handling the 3½ per cent stock with approximately one foot suction lift from the water level to the center line of the pump. The unit picks the stock up from a glass tank and delivers it to a tank overhead, from which the stock returns

to the glass tank. By means of a glass pipe line the path of the stock through the pipe line is clearly visible and interestingly reveals the action of the stock as it passes through an elbow in the pipe line. The Morris exhibit included type "S" slurry pumps, for handling chemicals, bleach liquor, etc., in paper mills. In attendance at the Morris booth were A. G. Forssell, chief engineer; W. H. Pfarrer, engineer; W. G. Starkweather, Boston representative and H. K. Sickler, Western Pennsylvania representative.

Morse Chain Co.

Morse Chain Company's exhibit consisted of the company's regular line of products—Silent and Roller Chain Drives—Chain and Morflex Flexible Couplings, and Kelpo Clutches. The exhibit was attended by the Boston representatives, F. G. Anderson and C. L. Pratt, Jr.; also by R. J. Koch, assistant sales manager, from Ithaca.

The Nash Engineering Co.

The main exhibit in the Nash Engineering Company booth was the Nash hytor cone vacuum pump. This has only one moving part, supported on a stiff shaft, carried in ball bearings outside the casing. There is no metal to metal contact, no gears and no cranks. Another display was a drier drainage pump consisting of a pumping unit comprising a hytor vacuum pump and a centrifugal condensate pump in one casing connected to a separating tank by means of a manifold. This unit is applicable to drier drainage systems producing a vacuum on the condensing driers where temperatures permit. The third exhibit was a Jennings centrifugal pump close coupled to a drip protected electric motor. The pedestal support is between the motor and pump preventing possible distortion and bearing strain which might result from heavy piping. The motor-end-shield has no openings for ventilation, the air being drawn in at the bottom of the rear end shield and blown out through the hollow pedestal support. The pump may be had with suction and discharge nozzles in a variety of positions greatly simplifying piping and saving space. Although the pump is of the vertical split casing type, the design is such that the impeller may be inspected or withdrawn without disturbing any piping.

New England Telephone and Telegraph Co.

The New England Telephone and Telegraph Company demonstrated its Teletypewriter Exchange Service. This is a service that does for the typewritten word what telephone service does for the spoken word. Subscribers to this service may be connected through the teletypewriter "central" to any other teletypewriter subscriber whether 300 feet or 3,000 miles away. The speed of this service is comparable with telephone service. Communication is two-way, both machines can send and receive on the same connection. Connections may be established for as short as three minutes or as long as is desired. Any typist can easily learn to operate the machine and from 100 to 150 words can be transmitted in three minutes. No charge is made for the machines, the only charge being for messages. Two teletypewriter machines were installed at the exposition and were connected to the teletypewriter "central" just like regular subscriber's service. Two operators demonstrated the service. Allan S. Morton and Robert A. Salomon, representatives of the Springfield District Sales Department, were in attendance to explain the use of the service to interested persons.

Norton Co.

Norton Company of Worcester, Mass., featured a new type of pulpstone known as the Norton Type "P" Pulpstone. They point out that the chief advantage of the new type lies in the fact that the mill has a lower initial investment. It has all of the good qualities of the Norton Pulpstones that have now been used for several years of which hundreds are in use and many of them having been in operation for five years or more. Experience with this stone in the mills has revealed the fact that many mills will welcome a stone of shorter life and correspondingly lower first cost. The shorter life stone affords more reasonable opportunity to overhaul equipment or to modify grit or structure to meet changing market or wood conditions. The Type "P" has about 40 per cent less abrasive at a corresponding reduction in price. A higher average peripheral speed throughout the life of the stone is maintained with the cost per ton of pulp remaining practically the same. Other interesting exhibits in the Norton space consisted of specimens of pulpwood collected from various parts of the world, a series of photographs showing types of damage to a stone, showing typical examples of what happens to a pulpstone when mistreated through carelessness or improper burring or adjustments. This exhibit also included a display of grinding wheels and other abrasive products such as used in the paper mill. Norton representatives were Bernard Bornstein and Robert I. Wynne-Roberts.

Oakite Products, Inc.

In its exhibit Oakite Products, Inc., showed a moving display illustrating fourteen of the principal paper mill operations for which Oakite materials have been developed. Included are such work as cleaning suction press rolls without hand drilling, washing of felts, cleaning of Foudrinier and cylinder wires, grinding of calender rolls and pressure cleaning of machinery before overhaul. On display also were more than fifty different materials made by Oakite Products, Inc., many of them designed specifically to meet the various cleaning tasks presented by paper mill operation and maintenance. The Oakite booth was attended by J. A. Carter, assistant sales manager, H. C. Duggan, New England division manager, F. W. Reese, Springfield representative, H. G. Johnson, Worcester representative, P. H. Harrod, Hartford representative, and J. E. Trask, Maine representative.

Oliver United Filters, Inc.

Oliver United Filters Inc., displayed samples of the rubber covered and case iron B type valve used in the Oliver Young Thickener, Bleach Washer, Brown Stock Washer. Also model sections showing drum construction and drainage. They showed a typical 21½ inch Oliver Automatic Valve used on Oliver Pulp Filters, particularly for separation of clear and cloudy filtrates. A typical example is in ground wood deckering where the cloudy effluent averages four or five pounds per thousand gallons, but the clear effluent averages less than a pound per thousand gallons and is reused at the wire showers on the paper machine. A cross section model of an Olivite Acid Handling Pump was displayed showing

the hard rubber lining, floating stuffing box, renewable shaft sleeves, split gland, and stuffing box drilled for circulation. In the pulp and paper industry this pump is used for handling alum and size solutions, bleach solutions and chlorinated water. The pump is made in 1¼ inch, 2 inch and 4 inch sizes arranged for direct connection or V-belt drive, having capacities up to 700 gallons per minute and a discharge head up to 150 feet.

Paper and Industrial Appliances Inc.

Paper and Industrial Appliances Inc. at its exhibit featured the Thorsen-Hery Beater, the T. B. M. Coarse Screen and Hydraulic Beating System.

The Thorsen-Hery Beater now in operation at the Delair plant of the Kieckhefer Company has worked so successfully that this company now has on order six additional beaters. These beaters will be arranged for continuous beating and will reduce the H.P. per ton for preparation of stock and improve the quality of the board or 9 point liner. The T.B.M. Screen as was shown by a photograph is in operation in a central western mill and is handling about 250 tons a day of filler stock. The rejects are picked up by the small roll from the large cylinder and are returned to the breaker beater again. All stock passing through the holes is good stock and goes to the chest for regular mill operation. The Hydraulic Beating System is used particularly for preparing stock for board mills.

Paper Makers Chemicals Div., Hercules Powder Co., Inc.

On a moving, circular exhibiting table, the products of the Paper Makers Chemicals Division were shown. One of the featured products was Tornalac which is a successful new corrosion resistant coating for protecting paper mill equipment against acids, alkalies and various fumes. Two latest copies of the company's attractive and popular house organ were also on the table.

The exhibit served as a meeting and resting place for all those interested in coming in. It's popularity was very evident by the fact that the booth was well occupied at all times.

Paper Makers Importing Co.

The Paper Makers Importing Company displayed pictures of the actual production of its china clay in Cornwall, England, and also had samples of the materials from start to finish, in other words, from the crude granite rock to the finished product. The booth was in charge of V. B. Case, of the Easton, Pa., office and J. D. Volckman, who is connected with Jas. W. Pyke & Co. of Montreal, Que., Canada, the Pyke Company being the company's representative in the Province of Quebec. This organization has been in the clay business since 1889, not only as importers but directly in the mining of clay in Cornwall, England, having frequent full cargo shipments to all the ports in the United States and Canada. The office is located in Easton, Pa.

Penick & Ford, Ltd., Inc.

Penick & Ford, Ltd., Inc., New York, had on display, samples from the kernel of corn to the finished products, featuring principally starch products, sold primarily to the paper mill industry, such as: papermakers pearl and powdered starches, Douglas clearsol gum, Douglas beater starch and other special starches. These were displayed in a very attractive manner. Those in attendance were: N. M. Kennedy (Eastern Bulk Sales Manager), L. W. Crouse, H. A. Harvey, O. R. Steffens and F. H. Leonard.

Reeves Pulley Co.

Reeves Pulley Company, of Columbus, Ind., principally showed Reeves Variable Speed Transmissions. No. 0 class "D" Horizontal open design with Hydraulic Control. No. 0 class "E" Horizontal Open Design. No. 0 class "B" Enclosed Horizontal Design equipped with Electric Remote Control. No. 00 class "E" Enclosed Vertical Design with Pivoting Motor Base. Reeves Vari-Speed Motor Pulley, No. 28 Countershaft type. Reeves Vari-Speed Motodrive, No. 3201-C-18 Vertical Type. Reeves Hydraulic Control, Reeves Electric Remote Control and Reeves Differential Control. The company was represented by D. W. Clem, W. J. Reeves, E. S. Redmerski, M. R. Snyder and I. V. Falk.

Rice, Barton & Fales

Rice, Barton & Fales, Inc., Worcester, Mass., builders of Paper Making Machinery, displayed a hypoid driving unit, doctors, steam joints and an impressive collection of pictures of Rice, Barton & Fales installations, including paper machines and pulp drying machines. In attendance at the Rice, Barton & Fales booth were G. A. Peterson, S. B. Stafford, L. M. Start and C. S. Barton.

Rollway Bearing Co., Inc.

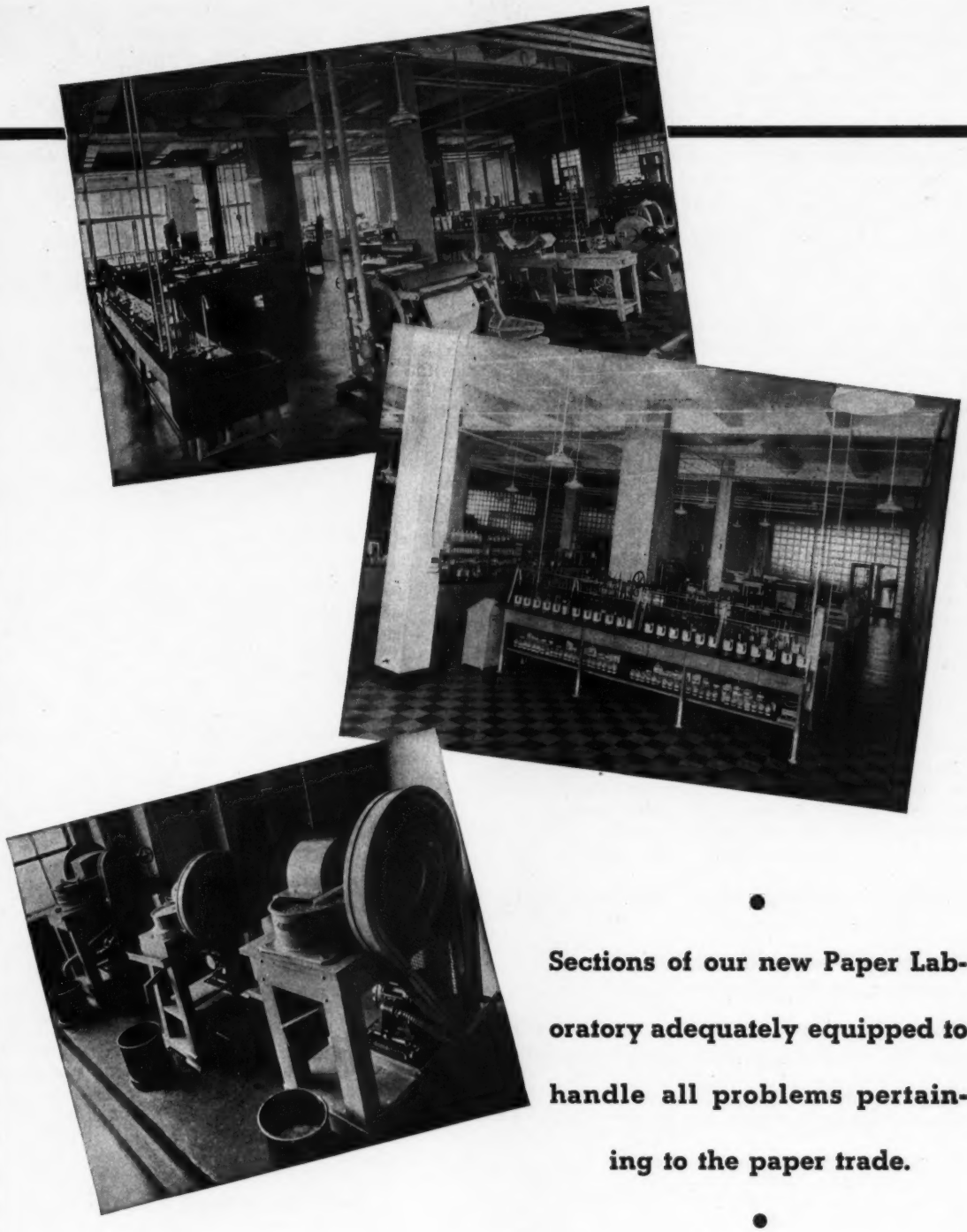
The Rollway exhibit was focussed on three types of bearings: Full roller radial for excessively heavy loads, press roll bearings for example. Floating Radial for maximum speeds and axial expansion or adjustment such as required by driers and jordans. Thrust Bearings—both double acting and single acting, illustrated by jordan and calender stack applications. Enlarged photostats of applications was an interesting part of the exhibit, showing precisely where and how straight radial and thrust bearings may best be used.

Joseph T. Ryerson & Son, Inc.

Joseph T. Ryerson & Son, Inc., Chicago, showed Ryertex non-metallic bearings and stainless steel castings for the paper industry. K. T. MacGill, F. W. Vogt and D. B. MacCleod represented the Ryerson company at the convention.

The Sandy Hill Iron and Brass Works

The Sandy Hill Iron and Brass Works exhibited an eight plate "Improved Packer Screen" showing the new roller shoe equipment which is proving such a marked success due to its quiet operation, lack of maintenance, and reduction of power. With this roller shoe equipment on a Packer screen the efficiency of the screen is maintained through its entire life at its maximum. As well as keeping the screen at maximum capacity it increases the diaphragm life many times, due to there being no variation in throw. There was also one of the new Sandy Hill shakes which was very interesting to the paper makers as the length of the stroke may be set by an indicator on the outside from any length from zero to seven eights of an inch, as well as the number of strokes per minute from 100 to 500. This makes it possible for the



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papermaker to know by referring to his records the length and number of strokes used on the shake on any previous order. Pictures were shown of the hypoid, spiral and besel gear sets for pocket grinders, the new continuous hydraulic Kamyr grinder and a Kamyr pulp machine. This is effecting great savings wherever it has been installed.

Sinclair Co.

Sinclair Company, Holyoke, Mass., featured the art work in connection with the manufacture of watermarked dandy rolls and the unusual application of an open end stand that used both open end and journal type dandy rolls. The company also showed a section of its deep grooved winding wire cylinder mould as well as the various regular and new meshes of wire cloth in Brass, Bronze, Monel and Stainless Steel.

A. E. Staley Manufacturing Co.

The booth of the A. E. Staley Manufacturing Company was used as a meeting place for superintendents to sit down and talk things over, rather than for advertising of the company's products.

Sturtevant Mill Co.

Sturtevant Mill Company, Boston, Mass., exhibited a full size Poirier Control, attached to the usual two compartment stuff box, together with illustrations of its operation. Owing to the extremely large size of the Sturtevant Bale Pulper, it is not possible to exhibit the machine itself, but enlarged photographs of the machine and its operation were displayed. Two other Sturtevant products: namely, the Poirier Vacuum Control Valve for use on suction boxes were illustrated, and shown, also the Poirier Multi-Syphon Leg. The exhibits were in charge of W. T. Doyle, vice president, and in attendance were Ernest Poirier, and Otto J. Goeppinger, special sales representatives.

S.K.F. Industries, Inc.

The S.K.F. Drier Cylinder Mounting was the feature of an exhibit, sponsored by S.K.F. Industries, Inc., Philadelphia. Because of the unique principle involved, this exhibit proved unusually interesting to paper mill superintendents. For this new mounting for the tending side of drier cylinders permits free expansion and contraction of the cylinder without imposing thrust loads of any nature on bearings or side frames. In addition, there was a complete line of S.K.F. ball and roller bearings and disassembled pillow blocks. Attending was H. H. DeMott, F. E. Ericson, C. N. Benson, B. R. Sackett, H. A. Fonda, W. C. Clingan, and F. B. Carlson.

Taylor Instrument Co.'s

In a beautiful exhibit done in modern style, the full line of Taylor instruments was shown, special emphasis being given to the Taylor Press Roll Load Recorder, Taylor Beater Roll Pressure Recorder, Taylor Calender Roll Load Indicator and the Taylor System of Grinder Control. The interesting new Binoc Tubing, now used on Taylor Industrial Thermometer was also shown. This remarkable development gives mercury and glass thermometers much greater readability, because of its unusual construction. C. D. DeMers, Rochester manager of the pulp and paper division of Taylor Instrument Companies was in charge of the exhibit with R. D. Cleveland, H. W. Kugler and C. H. Pierce from the Boston office also in attendance.

C. Tennant Sons & Co., Griplock Div.

On exhibit were several Griplock strapping tools used mainly for strapping bales of pulp after they have come from the hydraulic presses and for tying paper skids, cartons or boxes. It uses a non-stretch wire with a very high point efficiency. One of the more popular features is the ease and speed of its operation. The system is flexible enough so that it will fit in with any factory set-up. The Griplock Division has a packaging engineering service available to any pulp or paper mill in the United States and Canada.

Testing Machines, Inc.

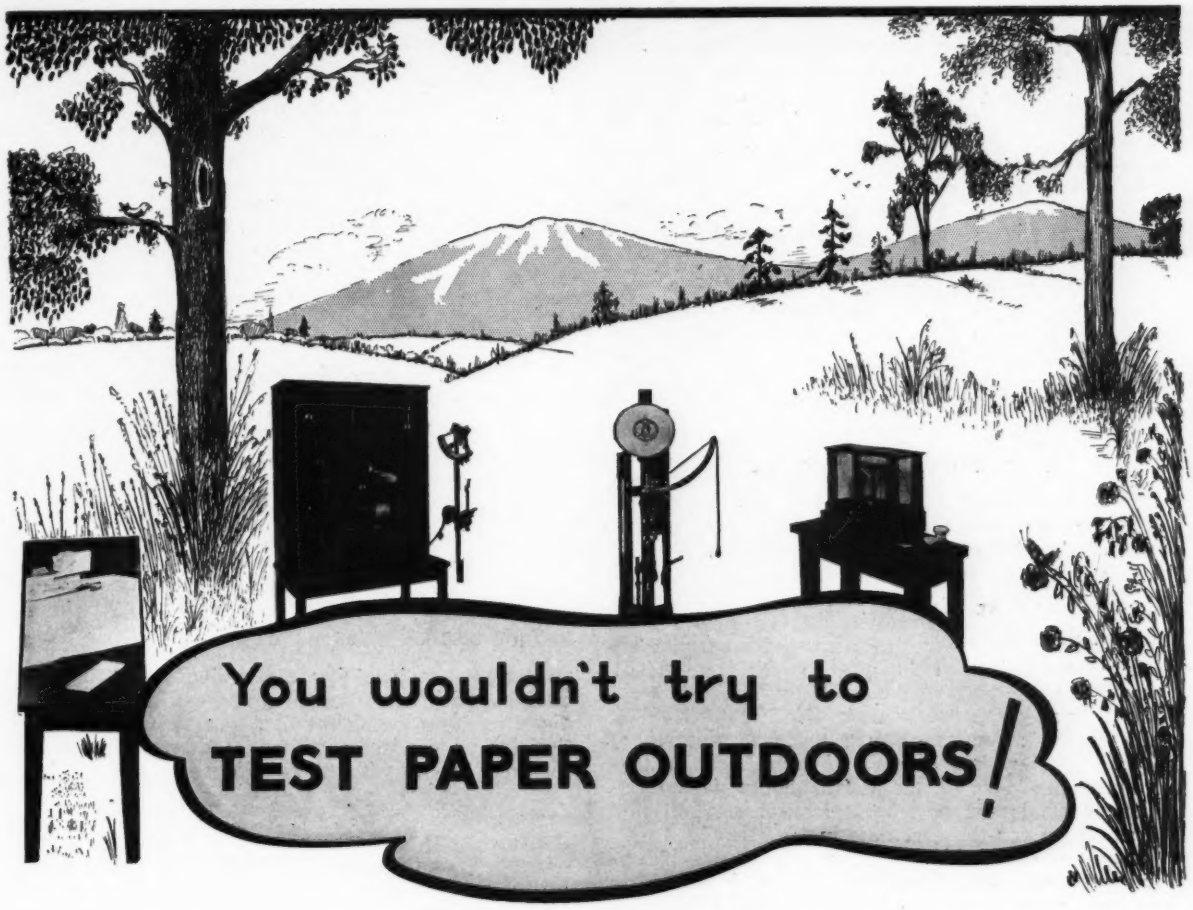
Testing Machines, Inc., New York, had on display the new Schopper Tensile Strength and Elongation Tester, Motor Driven with variable speed drive control, the Schopper Standard Folding Endurance Tester, the new Schopper Bending Fatigue Tester for papers, boards, cellophane, etc., Schopper Standard Micrometers, and paper scales. Information regarding the new Schopper Rapid Kothen Sheet Making Apparatus, and the new Johnston Fibre Classifier was given at the booth and also literature regarding all equipment was available.

Walworth Co., Inc.

The Walworth Company occupied an attractive display booth, 20 feet wide, 8 feet high and 12 feet deep. In the center of the background, recessed and illuminated there was a transparent photograph 3 x 4 feet of a composite view of five of the Walworth Works. The center portion of the background in which this panel appears is 10 feet wide. There is a wing of 5 feet on each side of the center portion of the background. On one wing the word "Tools" is lettered and on the other wing, the word "Fittings". There is also an illuminated panel in each wing, on which is listed some of the many products of the company. The lower portion of each wing contains shadow boxes in which many of smaller valves are shown, fittings and tools for use in the paper industry. In front of the large center panel are three platforms or steps, on which the larger valves, fittings, pipe and tools are displayed. The color scheme of the booth was made up of white and pastel tones of blue, with the name "Walworth" in red cut-out letters over the center of the main panel. Chairs of the modernistic type, chromium plated, with red leather cushions, a maroon rug and smoking stands, complete the equipment. The following Walworth Company representatives were present: H. W. Forbes, J. E. Hart, H. G. Lambert, G. R. Thomson, N. H. Brown, F. H. Cole and P. J. Doherty.

Warren Steam Pump Co., Inc.

The Warren Steam Pump Company's exhibit consisted of the following:—A Warren Centrifugal Stock Pump of the same type as the stock pumps furnished for the Crossett Mill and the new West Virginia Pulp and Paper Company Mill at Charleston, S. C., and the same as will be furnished the new mill of the Brunswick Pulp and Paper Company. A Warren Centrifugal Machine Chest Pump with performance chart. This pump will maintain an even volume of flow without pulsation and possesses many advantages not found in the plunger type of pump for the service. A Warren type "L" Liquor



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pump, for hot and cold corrosive liquors. This pump has an exceptionally deep stuffing box which is water cooled and also has renewable suction liner. It is extremely accessible and the rotating member can be removed without moving the motor or disconnecting either the suction or discharge pipe. In addition to the above, the company had a bearing pedestal for a centrifugal stock pump with shaft mounted on same and several types of impellers used in Warren stock pumps.

Westinghouse Electric & Mfg. Co.

One interesting feature of the Westinghouse booth was a Gearmotor which had been built into a specially designed glass case making the complete operation of the motor visible. Gearmotors have a great many applications in the paper industry, and this visible display enabled visitors to see the action of the motor and the gears under operating conditions. The exhibit also included a display of Micarta. This is a laminated plastic material which has found wide use for suction box covers and doctor blades, and the display included samples of these two applications. In addition, Micarta is used for bearings, gears, and shake springs. It has been found that Micarta will outlast metal in practically all similar applications of the types mentioned. The display included an Industrial Analyzer, which is a set of meters in one case so designed that complete tests can be made with only one set of connections. This allows the maintenance man to make tests more quickly and without danger of error through misconnections. One of the Westinghouse newest developments is the detachable instrument, and this was shown for the first time in New England. By using the detachable instrument, it is possible to make tests on a number of machines or in a number of places with only one instrument which is easily plugged into an inexpensive instrument socket. The same socket will accommodate an ammeter, wattmeter, or voltmeter, so that all types of readings may easily be made. The display also includes samples of standard and splash-proof motors, as well as latest types of De-ion linestarters and Nofuzo circuit breakers. The following Westinghouse men were in attendance: G. D. Bowne, manager, paper mill section, R. R. Baker, paper mill section, R. S. Marthens, manager gearing section, East Pittsburgh; H. D. Griffith, manager Springfield office; G. A. Sawin, Jr., New England advertising manager, W. L. Spraggon, control representative, J. S. McNulty, Micarta representative, H. F. Banan, Gearing representative, Boston; and A. E. Evans, general representative, Springfield.

Whiting Paper Co.

Whiting Paper Company's display consisted of a booth 12 feet wide and 15 feet deep. The background made of Rediprep board with the display copy "Whiting's Writing Papers". The tables for the display lined the three inside walls of the booth. The center display was a large box containing a dozen or so of the popular priced boxes of stationery. The balance of the display consisted of the showing of different boxes of stationery in the holiday line. An assortment of popular priced merchandise was on hand for sale. This layout was made by John E. Alcott, who was in attendance as well as Charles Davidson, Jr., and Robert Walsh.

Williams Apparatus Co.

Williams Apparatus Company presented a display of Williams Standard Testing Instruments, including hand sheet making equipment, freeness tester, pulp and paper moisture testers, stock disintegrators, centrifuge, as well as the latest model Williams smoothness and porosity tester. Shown for the first time was the Williams Graphic Surface Indicator, giving a visual image of the true surface of paper.

Williams Size and Service Corporation presented a demonstration of the new Williams size making machine in actual operation. This was the first public demonstration of this machine. In attendance at the booth were F. M. Williams, D. B. Williams and E. G. Crouse.

Worthington Pump & Machinery Corp.

Worthington Pump and Machinery Corporation, Harrison, N. J., had on display 4" FP-1 Stock Pump, Spare Rotating Element, 1½ CG Worthite Pump, 2-CU-1 Antaciron Pump, and 2" Flanged Worthite Valve.

Work of the Import Committee

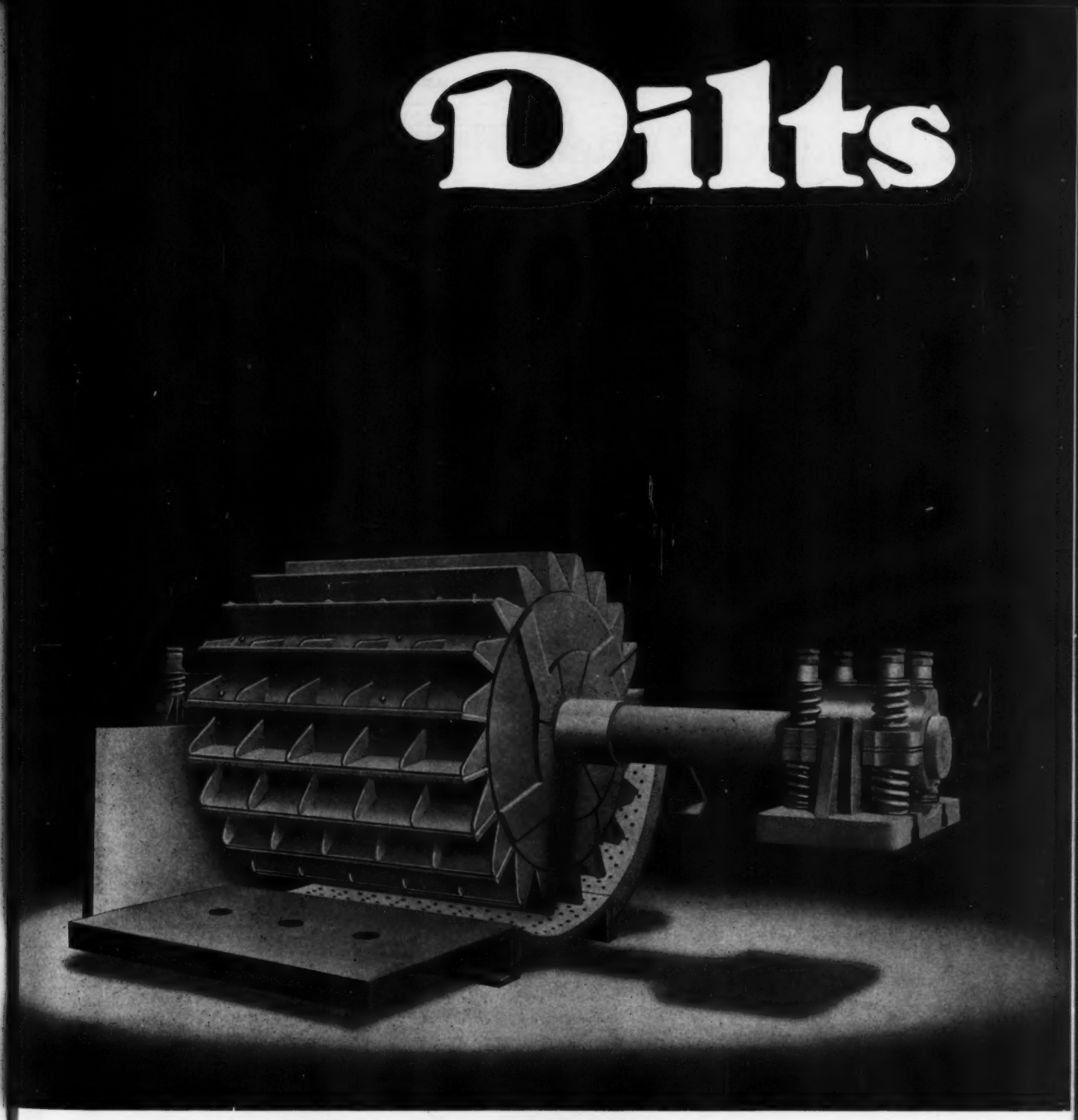
A test case involving the dutiability of X-Ray Screens has been decided by the United States Customs Court, which holds that the material is dutiable as coated cardboard at 30 per cent, the importer having claimed the proper rate to be the much lower rate of coated paper at 5 cents per pound and 15 per cent. Through legal technicalities the case has been closely involved with the efforts of importers to secure a lower rate of duty on bristol board than that of 3 cents per pound and 15 per cent now being collected as a result of the efforts of the Import Committee of the American Paper Industry.

A test case involving the dutiability of vat-lined pulp board imported for use in the manufacture of wallboard was decided by the United States Customs Court, the material being held to be dutiable at 30 per cent as vat-lined board. The court held that the Tariff Act provision was descriptive, and the witnesses for the importer admitted that the board consisted of four layers of pulp made from old stock, while the two outer layers were made of colored new pulp.

Embossed greaseproof imported at Boston for candy box layers has been classified for duty as greaseproof paper at 3 cents per pound and 15 per cent, but is claimed by the importer to be dutiable at 2 cents per pound and 10 per cent as vegetable parchment under the Belgian trade agreement and further subject to 20 per cent reduction from that figure on account of the Cuban reciprocal agreement preferential rate.

German vegetable parchment paper classified for duty at 3 cents per pound and 15 per cent as such is claimed by importer to be entitled, despite an adverse presidential proclamation, at 2 cents per pound and 10 per cent under the Belgian agreement. The President had proclaimed that German goods are not subject to the reductions provided under the reciprocal agreements because of discriminatory treatment of American goods by Germany.

Dilts



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- **BRACED BAR ROLL**—the heart of the breaker beater—the roll—the exclusive all steel braced bar bandless type roll—the strongest construction available anywhere—supported in double suspension spring bearings.
- **BREAKER SYSTEMS**—Cowles Classifiner—settling trough—thickeners—modern stock chests, propeller agitated—Hydrafiners—complete modern stock preparation systems.
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Those Who Attended the Convention

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A

James J. Andrews, Fox Paper Co., Lockland, Ohio.
P. J. Abel, Stickles Steam Specialty Co., Indianapolis, Michigan.
L. C. Adams, Great Northern Paper Co., Madison, Maine.
Samuel L. Allen, J. E. Rhoads & Sons, Philadelphia, Penn.
S. I. Anderson, Hooker Electro Chemical Co., New York, N. Y.
Oliver P. Arnold, Stowe-Woodward, Inc., Newton Upper Falls, Mass.
R. P. Abercrombie, Cheney Bigelow Wire Works, Springfield, Mass.
E. B. Abbott, Crane Co., South Boston, Mass.
Albert Allen, The Foxboro Company, Foxboro, Mass.
John B. Allen, Chromium Corporation of America, Waterbury, Conn.
E. G. Artz, Barrett-Cravens Co., Chicago, Ill.

B

Henry P. Baldwin, Consolidated Water Power Paper Co., Wisconsin Rapids, Wis.
F. L. Barstow, United States Rubber Co., New York, N. Y.
Ray L. Barton, Michigan Paper Co., Plainwell, Mich.
T. M. Barry, Fraser Paper Co., Madawaska, Maine.
B. Beasley, Brown Paper Mill Co., Monroe, La.
Leroy Benge, National Vulcanized Fibre Co., Wilmington, Del.
J. R. Blosser, Veldowen Co., Glens Falls, N. Y.
George A. Bogle, Central Fibre Products Co., Tama, Iowa.
W. Gordon Booth, Gair Container Co., New London, Conn.
F. C. Boyce, D. J. Murray Co., Wausau, Wis.
P. D. Bradley, Elk Paper Mfg. Co., Childs, Md.
Dr. C. A. Brautlecht, University of Maine, Orono, Maine.
L. H. Breyfogle, Draper Bros. Co., Canton, Mass.
A. W. Brook, Bellows Falls, Vt.
John H. Browne, Chemical Paper Co., Holyoke, Mass.
Herbert Brown, Howard Smith Paper Mills, Ltd., Beauharnois, Quebec.
W. H. Brydges, Bedford Pulp and Paper Co., Big Island, Va.
W. J. Burns, Sonoco Product Co., Rortsville, S. C.
John J. Burk, Bird & Son, East Walpole, Mass.
R. W. Bush, Provincial Paper Co., Thorold, Ont.
Fred H. Burrows, Burrows Paper Corp., Little Falls, N. Y.
C. L. Bachelder, Hercules Powder Co., Kalamazoo, Mich.
A. L. Bailey, Dupont Co., Providence, R. I.
R. K. Baker, Hampden Color & Chemical Co., Springfield, Mass.
Emmett Barney, Cornell Wood Products Co., Cornell, Wis.
P. W. Bartholomew, Hercules Powder Co., Kalamazoo, Mich.
A. C. Bate, American Cyanamid & Chemical Corp., Boston, Mass.
H. T. Baughman, West Virginia Pulp & Paper Co., Williamsburg, Pa.
Gene Bechard, Gene Bechard Co., Atlanta, Ga.
M. H. Bennett, Stebbins Engineering & Machine Co., Watertown, N. Y.
E. H. Berges, Farrel-Burringham Co., Ansonia, Conn.
F. E. Bentley, Noble & Wood Machine Co., Hoosick Falls, N. Y.
A. E. Broughton, A. E. Broughton Co., Glens Falls, N. Y.
H. A. Bolles, Strathmore Paper Co., Woronoco, Mass.
P. S. Bolton, Clinton Co., Boston, Mass.
H. H. Borrows, Manhattan Rubber Co., Passaic, N. J.
L. M. Booth, Booth Chemical Co., Elizabeth, N. J.
J. M. Booth, Huron Milling Co., Harbor Beach, Mich.
S. M. Bratton, Prisey-Jones Corp., Wilmington, Del.
John L. Brower, Gibbs Brower Co., New York, N. Y.
Spencer Brown, Appleton Woolen Mills, Appleton, Wis.
B. E. Brann, Brown Co., Berlin, N. H.
R. E. Briggs, Draper Felt Co., Canton, Mass.
A. C. Bright, Chemical Construction Corp., New York, N. Y.
Charles J. Brooks, Victor G. Bloede Co., Baltimore, Md.
August F. Brunell, Hercules Powder Co., Holyoke, Mass.
H. L. Buckner, Buckner Process Co., Worcester, Mass.
J. G. Bullard, Corn Products Refining Co., N. Y.
W. J. Burke, General Dyestuff Corp., Providence, R. I.
A. A. Buch, E. D. Jones & Sons, Pittsfield, Mass.
DeHaven Butterworth, H. W. Butterworth & Sons, Philadelphia, Pa.
W. E. Bailey, Dilts Machine Works, Fulton, N. Y.
R. R. Baker, Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.
G. A. Baker, Duriron Co., Dayton, Ohio.
P. D. Baldwin, Baldwin Belting & Leather Co., New York.
A. W. Barton, Horton Mfg. Co., Minneapolis, Minn.
E. R. Batchelder, Toledo Scale Co., Toledo, Ohio.
Charles L. Bauer, Bauer Bros. Co., Springfield, Ohio.
W. R. Bell, Ingersoll-Rand Co., Boston, Mass.
S. O. Belden, Crane Co., Springfield, Mass.
Donald M. Belcher, Chapman Valve Mfg. Co., Indian Orchard, Mass.
F. K. Becker, Bird Machine Co., South Walpole, Mass.
N. A. Billings, Heller & Merz, Boston, Mass.
David Blanchard, Magnus Chemical Co., Inc., Garwood, N. J.
H. N. Booker, Hermann Mfg. Co., Lancaster, Ohio.
G. D. Bowne, Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.
S. D. Brian, Paper Makers Importing Co., Easton, Pa.
Adrian A. Buck, Continental-Diamond Fibre Co., New York.
C. H. Butterfield, Midwest Fulton Machine Co., Dayton, Ohio.

C

Arthur E. Cobble, Wm. Cobble Wire Co., Brooklyn, N. Y.
A. G. Caldwell, Knox Woolen Co., Camden, Maine.
F. G. Calkin, Solvay Process Co., Syracuse, N. Y.
W. W. Campbell, Lockport Felt Co., Lockport, N. Y.
A. G. Cardwell, Krebs Pigment & Color Corp., Newark, N. J.
Ralph Carter, Highland Knitting Co., Springfield, Mass.
C. H. Champion, R. T. Vanderbilt, New York, N. Y.
Harold S. Chellis, Brown Company, Portland, Maine.
Ray L. Clary, S. D. Warren Co., Gardiner, Maine.
Arthur A. Coffin, Titanium Pigment Corp., New York, N. Y.
A. F. Crosby, American Writing Co., Westfield, Mass.
N. D. Cunningham, Keasby & Mattison, Amber, Pa.
Austin B. Calvin, Columbia Box Board Mills, Inc., Mellenville, N. Y.
W. H. Cape, S. D. Warren Co., Cumberland Mills, Me.
W. F. Carr, Jos. Parker & Son, New Haven, Conn.
Albert H. Carroll, Racquette River Paper Co., Potsdam, N. Y.
Charles Champion, Millers Falls Paper Co., Millers Falls, Mass.
David Clark, Wausau Paper Mill Co., Wausau, Wis.
John Coppens, Fraser Paper Ltd., Madawaska, Me.
George B. Congdon, Columbia Box Board Mills, Inc., Chatham, N. Y.
J. J. Cornell, *Wood Pulp & Paper News*, New York, N. Y.
John Williams Costello, Tonawanda Box Board Co., Tonawanda, N. Y.
R. M. Cook, Hinde & Dauch Paper Co., Toronto, Canada.
G. W. Craigie, Cumberland Mills, Maine.
W. H. Croft, Esleeck Co., Turners Falls, Mass.
Lester W. Crouse, Penick & Ford Co., New York.
Wallie H. Cunningham, Wausau Paper Mills Co., Wausau, Wis.
John G. Callan, Jr., Foxboro Co., Foxboro, Mass.
V. B. Case, Paper Makers Importing Co., Easton, Pa.
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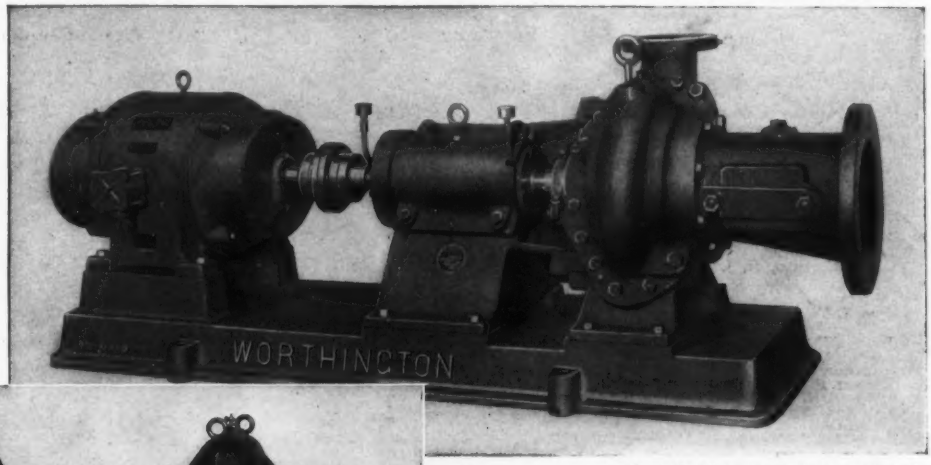

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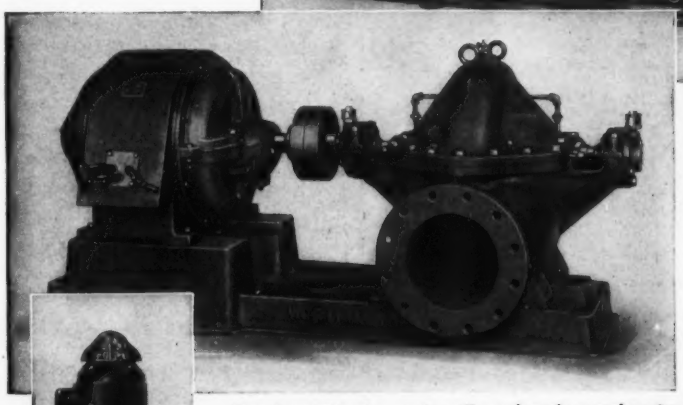
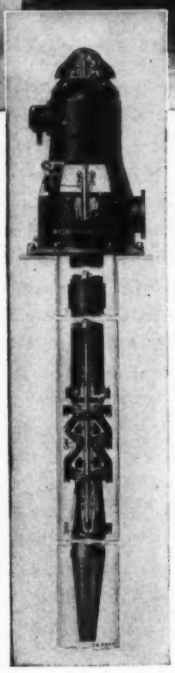


Type L centrifugal pump for mill supply and general service



Deep well turbine pump for water supply

Type CR pump for chemicals, acids, and caustic solutions

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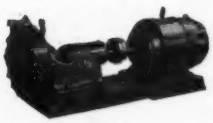
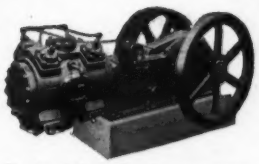


Type CD pump for black liquor



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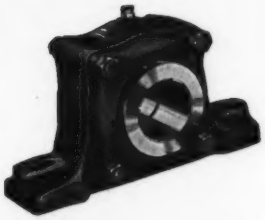
J. R. Roberts, duPont Co., Wilmington, Del.
F. A. Royse, Underwood Paper Co., Plattsburg, N. Y.
Fred J. Rooney, Wisconsin Wire Works, Appleton, Wis.
A. G. Rozvkie, Southern Kraft Corp., Mobile, Ala.
W. A. Rankin, Gake Corporation, Chicago, Ill.
A. E. Regnier, Hercules Powder Co., Stoneham, Mass.
E. S. Redmorski, Reeves Pulley Co .of N. Y., Inc., New York.
H. Irwin Reinhorn, Flexible Steel Lacing Co., Chicago, Ill.
Paul Richter, Oliver United Filters, Chicago, Ill.
T. C. Roberts, Beloit Iron Works, Beloit, Wis.
George Robertson, General Electric Co., Boston, Mass.
Jim Ryan, Rodney Hunt Machine Co., Orange, Mass.

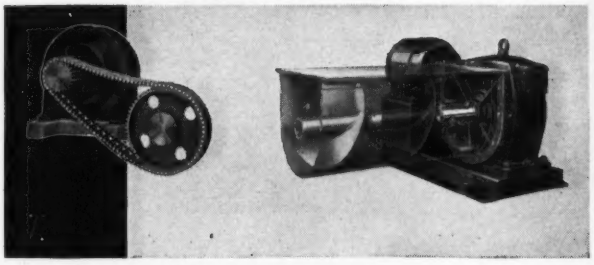
S

Walter L. Savell, Mathieson Alkali Works, Inc., New York.
H. F. Schenk, Wm. A. Hardy & Sons Co., Fitchburg, Mass.
C. M. Schermerhorn, Stowe-Woodward, Inc., Newton Upper Falls, Mass.
Fred W. Schneider, Hampden Color & Chemical Co., Springfield, Mass.
Norman Scott, Orr Felton Blanket Co., Piqua, Ohio.
C. M. Shipway, Wm. E. Hooper & Sons, Phila., Pa.
J. F. Shuman, Atterbury Bros., New York.
R. H. Simmons, U. S. Government Printing Office, Washington, D. C.
T. W. Small, Jr., Am. Cyanamid & Chemical Corp., Boston, Mass.
Harold Smith, John W. Bolton & Sons, Lawrence, Mass.
R. H. Smith, Reliance Electric & Eng. Co., Cleveland, O.
J. E. Snell, Hercules Powder Co., Holyoke, Mass.
W. F. Speerl, U. S. Rubber Products, Inc., New York.
H. Starr, Atterbury Bros., Inc., New York.
W. R. Steele, The Solvay Process Co., Syracuse, N. Y.
F. A. Strovink, Bennett, Inc., Cambridge, Mass.
Walter J. Sullivan, duPont Co., Belmont, Mass.
H. M. Sutton, Bagley & Sewall, Watertown, N. Y.
W. F. Swan, Standard Lime & Stone Co., Baltimore, Md.
H. E. Swank, Simonds Worden White Co., Dayton, Ohio.
R. D. Switzer, Heller & Merz, New York.
John W. Sale, Hummel-Ross Co., Hopewell, Va.
Nels H. Sandberg, Waldorf Paper Products Co., St. Paul, Minn.
J. Carl Schmidt, DuPont Co., Philadelphia, Pa.
Arthur T. Sawyer, Rogers Fiber Co., Inc., Bar Mills, Maine.
Laurence W. Shattuck, Strathmore Paper Co., Woronoco, Mass.
Harold W. Sherman, Northern Paper Mills, Green Bay, Wis.
Albert L. Sherwood, Sutherland Paper Co., Kalamazoo, Mich.
F. H. Show, Terre Haute Paper Co., Peoria, Ill.
Fred E. Smith, Hollingsworth & Vose Co., E. Walpole, Mass.
Lester J. Smith, International Paper Co., Ticonderoga, N. Y.
Jos. M. Smith, Wausau Paper Mill Co., Wausau, Wis.
Harold A. Smith, Hamersley Mfg. Co., Garfield, N. J.
C. B. Smith, Huron Milling Co., Harbor Beach, Mich.
Douglas W. Sommerville, Eastern Mfg. Co., Bangor, Maine.
Homer E. Stafford, Hawthorne Paper Co., Kalamazoo, Mich.
Oscar Stamets, Riegel Paper Corp., Riegelsville, N. J.
Edw. L. Stansell, Provincial Paper, Ltd., Mille Roches, Ont.
J. N. Stephenson, Pulp & Paper Magazine of Canada, Gardenvale, Que.
Robert B. Stewart, Kalamazoo Vegetable Parchment Co., Kalamazoo, Mich.
C. E. Stoke, Tomahawk Kraft Co., Tomahawk, Wis.
Glen Sutton, Sutherland Paper St., Kalamazoo, Mich.
B. R. Sackett, S.K.F. Industries, Inc., Philadelphia, Pa.
G. A. Sawin, Westinghouse Elec. Co., Boston, Mass.
C. B. Sawyer, Rollway Bearing Co., Inc., Syracuse, N. Y.
H. Z. Schniewind, Testing Machines, Inc., New York.
J. P. Scobie, Mason-Neilan Regulator Co., Boston, Mass.
K. R. Scribner, Barkon-Frink Tube Ltd., Long Island City, N. Y.
P. S. Sinclair, The Sinclair Co., Holyoke, Mass.
R. Skagerberg, Brown Instrument Co., Philadelphia, Pa.
Walter Slattery, Sinclair Co., Middletown, Ohio.
Charles P. Slocum, Corn Products Sales, Boston, Mass.
J. J. Stein, Graton & Knight Co., Worcester, Mass.
T. B. Smith, American Brass Co., Detroit, Mich.
Leon E. Smith, Downingtown Mfg. Co., Downingtown, Pa.
Richmond U. Smith, Bird Machine Co., Walpole, Mass.
Geo. H. Spencer, E. D. Jones & Sons Co., Pittsfield, Mass.
Stephen B. Stafford, Rice, Barton & Fales, Worcester, Mass.
Avery H. Stanton, Mason-Neilan Regulator Co., Boston, Mass.
J. C. Standish, Albany Felt Co., Albany, N. Y.
C. F. Stanton, Duriron Co., Boston, Mass.
O. R. Steffens, Penick & Ford, Ltd., New York City
P. B. Stull, Hercules Powder Co., Inc., Kalamazoo, Mich.
Walter Steves, Worthington Pump & Machine Co., Harrison, N. J.
W. D. Strowd, F. C. Huyck, Son, Albany, N. Y.
E. J. Sullivan, Acorn Refining Co., Cleveland, Ohio.

T

E. L. Tewksbury, Stowe Woodard Co., Newton Upper Falls, Mass.
Jos. J. Thomas, Rohm & Haas Co., Inc., Philadelphia, Pa.
George A. Thompson, Jr., B. F. Perkins & Son, Inc., Holyoke, Mass.
W. O. Thompson, Krebs Pigment & Cooler Corp., Everett, Mass.
Fletcher Thornton, Stowe Woodward, Inc., New York.
C. D. Townsend, United States Rubber Products, Inc.
R. J. Tutt, Jr., Peter Cooper Corp., Gowanda, N. Y.
Peter Talbot, St. Crix Co., Woodland, Maine.
Leonard P. Taylor, American Writing Paper Co., Holyoke, Mass.
B. E. Teale, Ancram Paper Mills, Ancram, N. Y.
Killey E. Terry, S. D. Warren Co., Cumberland Mills, Maine.
William H. Teter, Mead Corp., Kingsport, Tenn.
D. M. Thomas, Container Corp., Philadelphia, Pa.
F. J. Timmerman, Northern Tissue Mills, Green Bay, Wis.





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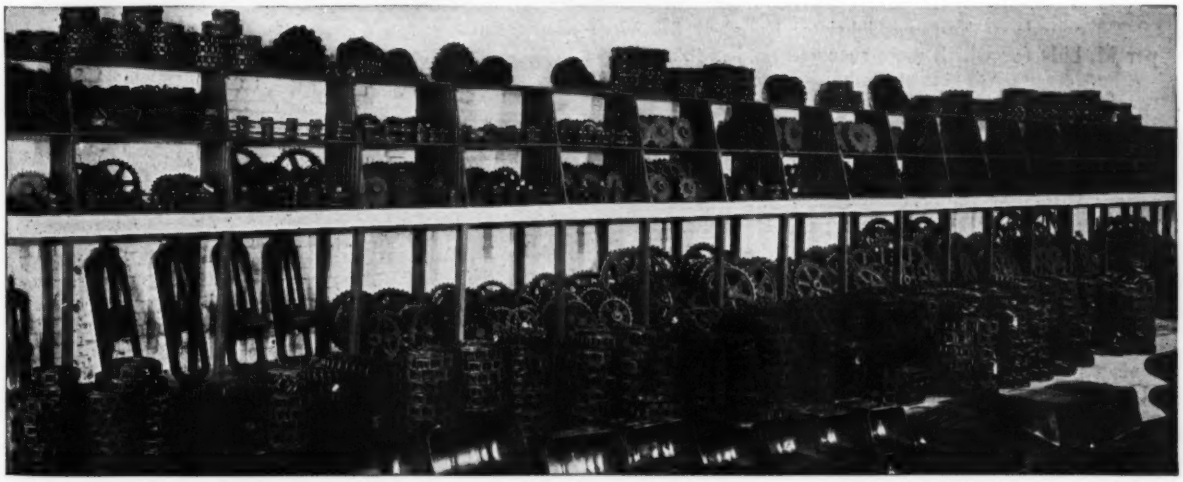


Richard Tobin, National Cellulose Corp., Baldwinsville, N. Y.
R. J. Trammell, Champion Paper & Fibre, Canton, N. C.
Charles H. Tavener, Kaye & MacDonald, W. Orange, N. J.
L. A. Thompson, Hercules Powder Co., Holyoke, Mass.
G. A. Thomson, Walworth Co., New York.
J. J. Thompson, Worthington Pump & Mach. Corp., Chicago, Ill.
R. J. Thompson, C. Tennant Sons & Co., New York.
L. L. Tiffany, Gulf Oil Corp., Boston, Mass.

V

J. B. Venturine, Cameron Machine Co., Brooklyn, N. Y.
C. Vicario, Nash Engineering Co., New York.
C. H. Vickery, E. D. Jones & Co., Pittsfield, Mass.
A. B. Vincent, Socony Vacuum Oil Co., Albany, N. Y.
J. D. Volckman, Jas. W. Pyke & Co., Ltd., Montreal, Can.

W

J. E. Waterhouse, Montague Machine Co., Turners Falls, Mass.
A. E. Waugh, U. S. Rubber Products, Philadelphia, Pa.
J. A. Waters, American Wringer Co., Woonsocket, R. I.
N. O. Weil, W. S. Taylor Co., Cleveland, Ohio.
R. N. Wellington, Simonds-Worden White Co., Dayton, Ohio.
A. J. Weiss, Lowe Paper Co., Ridgefield, N. J.
W. B. West, Bradford West Co., Pittsfield, Mass.
Washburn Weston, American Wringer Co., Woonsocket, R. I.
Robert L. Wickes, American Leather Belt Association, New York City.
A. B. Williams, American Wringer Co., Farnham, Que.
H. K. Williamson, Williamson Research Co., New York.
Paul Wilkinson, W. Va. P. & P. Co., Williamsburg, Pa.
Chas. E. Walker, Eastern Mfg. Co., Brewer, Me.
H. R. Wheeler, Victoria Paper Mills Co., Fulton, N. Y.
A. Wiberg, Gilbert Paper Co., Monaska, Wis.
H. L. Winchell, Scott Paper Co., Chester, Pa.
Vernon Woodside, Mathieson Alkali Works, New York.
J. F. Wright, National Aniline & Chemical Co., New York.
Harry E. Wallace, Rogers Fiber Co., Inc., Bar Mills, Maine.
H. A. Webb, Albia Box & Paper Co., Troy, N. Y.
L. E. Weiser, National Folding Box Co., New Haven, Conn.
S. D. Wells, Combined Locks, Wis.
Fred Wells, Ohio Box Board, Rittman, Ohio.
S. C. Wentz, P. H. Glatfelter Co., Spring Grove, Pa.
H. E. Weston, *The Paper Industry*, Chicago, Ill.
Mark M. Whitman, Marathon Paper Co., Rothschild, Wis.
Almeron Wickham, Mackandres & Forbes, Camden, N. J.
Walter F. Wolfe, MacSim Bar Paper Co., Otsego, Mich.
James H. Wahl, Chapman Valve Mfg. Co., Indian Orchard, Mass.
G. C. Walton, Downington Mfg. Co., Downington, Pa.
A. P. Wandtke, Heller & Merz, New York.
N. P. Wardwell, Carthage Machine Co., Carthage, N. Y.
A. N. Watts, Cheney Bigelow Wire Works, Springfield, Mass.
E. E. Wasselhoff, Morse Chain Corp., Ithaca, N. Y.
L. N. Wheelock, Boiler Equipment & Trust, No. Amherst, Mass.
William Whiting, Whiting Paper, Holyoke, Mass.
Winn Willard, Link Belt Co., Boston, Mass.
M. K. Williams, France Packing Co., Philadelphia, Pa.
F. M. Williams, Williams Size & Serv. Corp., Watertown, N. Y.
J. B. Williams, Cheney Bigelow Wire Works, Springfield, Mass.
J. A. Williams, New England Tel. & Tel. Co., Springfield, Mass.
D. Williams, Williams Apparatus Co., Watertown, N. Y.
Owen Williams, France Packing Co., Philadelphia, Pa.
J. W. Woodward, The American Brass Co., Waterbury, Conn.
J. A. Wright, The American Brass Co., Waterbury, Conn.
R. I. Wynne-Roberts, Norton Company, Worcester, Mass.

Y

C. E. Youngchild, International Paper Co., New York.
Wesley Youngchild, International Paper Co., New York.
H. E. Young, H. W. Case Sales Co., Orange, N. J.
G. H. Young, Midwest Fulton Mach. Co., Dayton, Ohio.

Z

F. L. Zellers, French Paper Co., Niles, Mich.
W. J. Zeeland, Bird Machine Co., South Walpole, Mass.

Government Paper Bids and Awards

[FROM OUR REGULAR CORRESPONDENT]

WASHINGTON, D. C., June 30, 1937—The Government Printing Office has announced the following paper awards.

The Marquette Paper Company will furnish 60,000 pounds of melon and green wood bristol board in 20 inch rolls at 4.97 cents per pound and Barton, Duer & Koch Paper Company will furnish 6,120 pounds (30,000 sheets) of 21 x 31 green wood bristol board at 5.15 cents, bids for which were received on June 11.

The R. P. Andrews Paper Company will furnish 93,800 pounds (700,000 sheets of 38 x 48 M. F. book paper at 6.51 cents per pound. L. Hyman & Sons will furnish 90,000 pounds of various sizes chip board at 2.075 cents per pound and the Cauthorne Paper Company will furnish 50,000 pounds (500,000 sheets) of 25 x 38 antique book paper at 6.14 cents per pound. Barton, Duer & Koch Paper Company will furnish 3,875 pounds (50,000 sheets) of 24 x 38, 100 per cent rag, white bond paper at 23.5 cents per pound. Bids for all of these items were received on June 9.

The R. P. Andrews Paper Company will furnish 60,000 pounds of buff wood bristol board at $47.45 per M, bids for which were received on June 7.

The Northern Pacific Bank Note Company will furnish 1,000 sheets of 16 x 18 waterproof paper at $42.85, bids for which were received on June 2.

The Printing Office has received the following bids for 350,000 pounds of supercalendered book paper; Whitaker Paper Company, 5.82 cents; Stanford Paper Company, 5.82 cents; and R. P. Andrews Paper Company, 5.74 cents.

For 200,000 pounds of M. F. book paper: John F. Post, Inc., 6.36 cents; Whitaker Paper Company, 6.11 cents; R. P. Andrews Paper Company, 6.11 cents; Barton, Duer & Koch Paper Company, 6.16 cents; Stanford Paper Company, 6.14 cents; and Marquette Paper Company, 6.59 cents (for 150,000 pounds only).

Reese & Reese, Inc., will furnish 5,460 pounds (52,000 sheets) of 26 x 32 white M. F. printing paper at 5.92 cents per pound and Dobler & Mudge will furnish 80,000 pounds of supercalendered book paper in 28½ inch rolls at 6.11 cents per pound. Bids for these items were received on June 14.

Barton, Duer & Koch Paper Company will furnish 20,000 sheets of 22 x 28 buff railroad board at $29.02 per M sheets, bids for which were received on June 4.

The following bids were received for 70,000 pounds (100,000 sheets) of chip board: Enterprise Paper Company, 2.06 cents; Reese & Reese, Inc., 2.154 cents; Barton, Duer & Koch Paper Company, 2.039 cents; Stanford Paper Company, 2.07 cents; Mathers-Lamm Paper Company, 2.09 cents; Virginia Paper Company, 2.029 cents; Dobler & Mudge, 2.069 cents; R. P. Andrews Paper Company, 2.07 cents; Old Dominion Paper Company, 2.048 cents; L. Hyman & Sons, 2.075 cents; Whitaker Paper Company, 2.039 cents; Container Corporation of America, 2.125 cents; and Walker, Goulard, Plehn Company, 2.09 cents.

For 39,900 pounds (450,000 sheets) of 28 x 34 and 24 x 38 yellow sulphite writing paper: Virginia Paper Company, 7.17 cents (all or none); Stamford Paper Company, 7.92 cents; Barton, Duer & Koch Paper Company, 7.63 cents; Cauthorne Paper Company, 7.375 cents; R. P. Andrews Paper Company, 7.17 cents; Marquette Paper Company, 7.75 cents; and Reese & Reese, Inc., 7.38 cents.

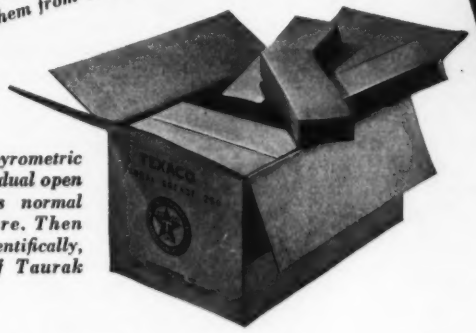
New Allis-Chalmers Bulletin

Allis-Chalmers Manufacturing Company, Milwaukee, Wis., has issued a new Blower and Compressor Bulletin, No. 1910, intended to show briefly all the types made by that company. These include certrifugal, rotary and reciprocating units which can be furnished complete with their prime movers, whether electric motors, steam turbines, or steam engines, for all ordinary applications involving air or gas.

NOW—KEEP 'EM all COOL!

You'll have less overheating of open bearings when you select the lubricant for them in accordance with their normal running temperatures. This known, you can select the exact Taurak they need to keep them from overheating.

Many lubricants for open bearings glaze over and fail to lubricate because they are not suited to the operating conditions. Others leak out and waste away for the same reason. Taurak comes in 3 grades, one of which is sure to be just right.



Texaco men take pyrometric readings of each individual open bearing, to learn its normal operating temperature. Then they can specify scientifically, just which grade of Taurak should be used.

Now a lubricant for open bearings can be selected to suit the normal operating temperatures of each individual bearing . . . it is Texaco Taurak.

This new lubricant is available in three different grades, each suitable for definite temperature range. Before specifying Taurak, Texaco men now take pyrometric temperature readings of each bearing. As a result of this scientific selection, you are assured that your open bearings will run at normal temperatures.

Trained lubrication engineers are available for consultation on the selection and application of Texaco Petroleum Products. Prompt deliveries assured through 2020 warehouse plants throughout the United States. The Texas Company, 135 East 42nd Street, New York City.

TEXACO

TEXACO *Industrial Lubricants*

Big Newsprint Boom Under Way in Canada

All Machines In Production Have Been Operating Near Capacity Since First of Year — John Stadler Says That While Outlook Is Bright Prospects Should Not Be Exaggerated—Finland Is Only Likely Competitor.

[FROM OUR REGULAR CORRESPONDENT]

MONTREAL, Que., June 28, 1937—There is no longer any doubt that the biggest boom in newsprint production that Canada has experienced is now under way. The all-time high level of production in May, when 309,232 tons were produced, brought the total production for the first five months of the calendar year to 1,471,912 tons, which was 21.2 per cent higher than the production during the first five months of 1936. If present conditions continue, the prospects are that production for the full year will be around 3,600,000 tons, as compared with 3,190,599 tons for 1936.

The export figures for May, just released by the Government, are remarkable. They show that for the second time in the past year, the value of the newsprint exported exceeded $10,000,000.

Wood pulp exports also showed an increase in May, especially sulphite. Total exports of wood pulp amounted to 1,589,614 cwt., valued at $3,682,140, as compared with 1,330,177 cwt., valued at $2,631,242 in May, 1936.

Production at Capacity

Since the beginning of the year all the newsprint machines in production have been operated near to capacity. Some idle machines have been put into production, and others are being prepared for operation later in the year. This is expected to take care of the 1937 demand. With various companies expanding their capacity it has been estimated that with all the machines which can be effectively used at present price levels operating at capacity about 4,000,000 tons of newsprint could be produced in 1938, so that no actual shortage is contemplated.

A factor in the situation is the increasing costs, which have been steadily rising. Increased wage levels and other items, such as the need for capital outlay, are expected to raise the costs for 1938 around $2.50 to $3.00 per ton, which it is anticipated, will be met by a higher price for newsprint. The increasing importance of markets other than that of the United States has a bearing on the situation. Contracts for future delivery in Australia are now being accepted at $62.50 per long ton for 1938 delivery, which reflects a recent increase of $15 over 1936. Canadian newsprint has been selling in Argentina and Brazil at £10. 10/- per metric ton, but the price has been increased to £13. 15/- for delivery between September 1st next and June 30, 1938. These prices are equivalent to about $46.50 and $61.00 per short ton. In China, Canadian newsprint is selling for $70.00 to $75.00 per long ton, and in Japan at more than $70.00 per long ton.

Plea Not To Exaggerate Newsprint Profit Outlook

John Stadler, consulting newsprint engineer, of Montreal, in an address at the annual meeting of the Investment Dealers' Association of Canada, stated that while the outlook for profit in the newsprint industry was bright, it should not be exaggerated. It seemed, he said, that the base price of $50 per ton was the price at which this commodity would be sold for the first half of next year, and at the same time there was talk going on about a $65 price for the second half of next year. The same applied to the sulphite pulp market. At the present time prices as high as $70 per ton were quoted for unbleached pulp, and bleached pulp was being quoted as high as $90 per ton.

"Such figures in my opinion are ridiculous," he said, "they are brought about by the extreme shortage of this commodity. It is my sincere hope that very little pulp will be sold at such high prices, because if much is sold it could not do otherwise than eventually create an unfavorable reaction."

The conditions under which a remunerative return could be expected included adequate provision for depreciation and obsolescence, and both these in recent years had been neglected. Any manufacturer to give service must reserve from 15 per cent to 20 per cent of his productive capacity, and the newsprint industry had not at the present time the reserve capacity a prudent manufacturer should have, to protect his customer."

He continued: "We are all aware that since 1930 no new machines for making newsprint have been added in Canada, but during that period many newsprint machines have been installed in England, France, Belgium, Hungary, Germany and last but not least, in Finland. With the exception of the installations made in Finland and Hungary, all other machines have been installed in converting mills and are therefore dependent on the supply of pulpwood or pulp from other countries.

"This conclusively shows that if we do not expand our facilities for producing cheap newsprint paper, other countries who have the raw material will provide same.

"We know that at the present time only two new machines are being installed in western Europe, one in England and the other one in France. We are informed, however, that replacements are taking place for several machines in Finland. It is my opinion that when old machines are being replaced by new ones, invariably the capacity of a new machine will be at least five times that of the old machine. I have actually replaced several machines in those countries to which I have referred, and the new machine invariably produces a little more than five times as much as the old one.

"With that in view there is additional new production of newsprint in sight, but in my humble opinion, I consider only production from Finland as being competitive. Other countries who do not have their own raw material will have to purchase same at such a price that they cannot afford to sell newsprint at a price which would not give a profitable return to the efficient Canadian producer.

"What about pulp? Can we here in Canada pro-

duce mechanical and chemical pulp and compete with world's markets?

"My answer is yes, but we must be careful in the selection and development of our available natural resources in relation to our markets.

"It is unfortunate that for almost 15 years Canada has not supported the pulp industry. This is to a large extent brought about by the fact that the investing public in Canada could not differentiate between newsprint and pulp.

"As a result of this, developments for the manufacture of chemical pulp have been made everywhere else, where suitable pulpwood was available, except in Canada. And in some of the plants built outside Canada, our pulpwood is used to produce what we should make from our own raw materials."

He referred to the fact that the Quebec Government had recently authorized negotiations for the export of 600,000 cords of pulpwood to European producers of pulp, and that the Premier of Ontario had made a statement encouraging the export of pulpwood which would otherwise go to waste in the forests, and proceeded to urge some financing on a strictly business basis of enterprise for the manufacture in Canada of newsprint and pulp, saying that water must not be put into stock, because watered stock would not work.

Production of newsprint from Southern pine, he said, was at present only experimental. As to Russia he thought that for the next 10 years it would have a great problem to supply its own requirements. He thought also that it would be many years being any important production of newsprint by Japan and Manchukuo would take place, and he added:

"Not so very long ago, in fact in 1929, of the entire world production of newsprint, 60 per cent was used in the United States. The production of newsprint in the world today is much greater than it was in 1929, but the United States is now using only 40 per cent of the world production. From that we may draw some conclusions as to what is taking place elsewhere than on the North American hemisphere."

Uses Newsprint From Southern Pine

A press dispatch from Lewiston, Me., under date of June 26 says that the Lewiston *Daily Sun* reported today that its editions, issued on paper made experimentally by the Great Northern Paper Company from Southern slash pine pulp, "printed well." It was the first instance, the paper company reported, that a newspaper had been issued on paper manufactured from the Southern pine in a commercial mill.

"We ran without any press trouble," said Frank S. Hoy, business manager of the *Sun*. "The color—a slight cream tinge—would not be noticed by the reader, I believe. It printed well. We are printing *The Journal*, our evening paper, from the same stock today."

Cowles Classifiner

Dilts Machine Works, Inc., Fulton, N. Y., have just issued an exceptionally attractive pamphlet entitled Cowles Classifiner, which gives some interesting facts regarding this equipment, which has a background of successful, actual operating experience under a wide variety of conditions. The pamphlet may be had by addressing the company at Fulton, N. Y.

Obituary

J. Wallace Tower

J. Wallace Tower, consulting engineer, and partner in the firm of Hardy S. Ferguson & Co., died suddenly in his sleep on Monday morning, June 21, in his apartment at the Hotel Flanders, New York City. He was in his sixty-sixth year, and his death was attributed to a heart attack.

Mr. Tower was born and educated in Holyoke, Mass., the son of Charles H. and Sarah Young Tower. He commenced his engineering career with the firm of D. H. and A. B. Tower, consulting engineers and architects of Holyoke, and later went with P. H. Ellsworth also of Holyoke, where he remained until 1898. In that year he was engaged by Hardy S. Ferguson to assist in the design and construction of the Great Northern Paper Mills at Millinocket, Maine. In 1911, when Mr. Ferguson moved his offices to New York, Mr. Tower came to this city, and in 1928 he became a partner in the firm of H. S. Ferguson & Co. He was unmarried, and was the last surviving member of his family. He was a direct descendant of Richard Warren, a passenger on the Mayflower on the voyage which terminated at Plymouth, New England, 1620, and was a member of the New and General Society of Mayflower Descendants. His father Charles Henry Tower died at Holyoke, Mass., on November 18, 1918 in his ninetieth year; his mother, Mrs. Sarah Young Tower, died at Holyoke on May 30, 1932, at the age of eighty-eight.

Mr. Tower was president of the Tower Genealogical Society, incorporated in 1909.

Mr. Tower was a member of the Kora Temple, A.A.O.N.M.S. of Lewiston, Maine; Bangor Council, No. 5, R. & S. M.; Mt. Horeb Chapter, No. 49, R.A.M., Mattawamkeag, Maine; Nollesemic Lodge, No. 205, A. F. & A. M., Millinocket, Maine; St. John's Commandery No. 3, Knights Templar, Bangor, Maine; Maine Consistory, S.P.R.S., thirty-second degree, Valley of Portland, Maine; Bangor Chapter of Rose Croix, eighteenth degree A. & A. S. R.; Palestine Council, Princes of Jerusalem, sixteenth degree; Eastern Star Lodge of Perfection, fourteenth degree:

The most recent engineering work on which Mr. Tower was engaged was the design and construction of the pulp and paper mill for the Crossett Paper Mills, at Crossett, Ark.

Mr. Tower was also a member of the National Travel Club and made many voyages to the Mediterranean and the Islands in the Southern Atlantic. He was an ardent stamp collector and amateur photographer.

Funeral services were held at his late residence, 382 Pleasant street, Holyoke, Mass., and interment was in Forestdale Cemetery, in that city, on June 23, 1937.

Sturtevant Bale Pulper

The Sturtevant Mill Company, Dorchester, Mass., has issued an interesting booklet entitled Bale Pulper. The booklet tells in an interesting manner just how this device works "from Bale to Slush" all in one operation. Copies of the booklet may be obtained by applying to the company at Harrison Square, Boston, Mass.

Paper Board Industry Forging Ahead

Chicago Reports Paper Mills With Remarkable Backlog of Orders — Higher Prices In Fall Season Likely—Market Generally Gives Good Account of Itself — Paper In Seventh District Continues To Improve.

[FROM OUR REGULAR CORRESPONDENT]

CHICAGO, Ill., June 28, 1937—Headlining local news for the week as far as the paperboard industry is concerned, is the report that profits of the paperboard interests are running at record levels with business actually taxing producing facilities. The Container Corporation of America, made approximately as much money in the first five months of 1937 as it did the entire year of 1936. In fact, in the five months ending May 31 the Chicago concern earned $1,300,000, after all charges, equal to about $2 a share on the capital stock now outstanding.

What the remainder of 1937 may show is an uncertain factor, say local reports, although the last half of the year is normally better than the first half with September and October peak months. The high for the initial five months was reached late in April and since that time sales volume has declined though not enough to reduce the heavy backlog of the industry despite that capacity production was maintained at least up until June 1.

The paperboard industry's backlog is now reported as larger than at any similar time in the history of the industry. On June 5 business represented almost eleven days production at capacity compared with sixteen days at the April peak which was an all round high. The June figure compares to a normal backlog of about six days. The recent trend toward lower volume has not as yet disturbed the price structure though the rough sledding experienced by waste papers has had its effect on the boxboard market in particular. The addition of about 600,000 tons or approximately 10 per cent to the industry's annual capacity resulting from the new construction of plants is not expected to enter in as a market factor for several months and is also expected to be absorbed without any difficulty.

Legislative Trend

The Illinois legislature reaches its final three day stretch promising to give the Illinois paper industry the following "breaks" or "misfortunes": The Women's 8 Hour bill, passed, will stringently limit working hours for females to eight hours a day. An act designed materially to increase workmen's compensation rates in Illinois has passed the House of Representatives with the dangerous chance that it will get through the Senate and add appreciably to State costs of doing business as represented in increased insurance rates. The "use tax" for Illinois seems likely to be lost in the final jam and the bill designed to put printing and allied service industries under the sales tax seems destined to meet the same fate with paper concerns being forced to continue to shoulder this cost.

Meanwhile, Illinois is preparing to pass an unemployment compensation insurance act which is considered one of the most practical in the United States. The Act, which has passed the Senate and is in third reading in the House, sets up a pool fund plan with good merit rating requirements, safeguards the power of the administrative body and otherwise meets with the approval of various employer organizations who spent many months working on the bill.

The Legislature is expected to adjourn sine die on June 30.

A Steady Volume of Business

The Chicago paper industry continues to give an excellent account of itself market wise. Local reports indicate a steady volume though decreased from the peak set approximately June 1. However, mills continue to run at near capacity with the remarkable backlog of the general industry only slightly under top figures. While prices have not generally advanced during the week, there is an undercurrent of opinion that seems certain to crystallize into higher prices in the early Fall.

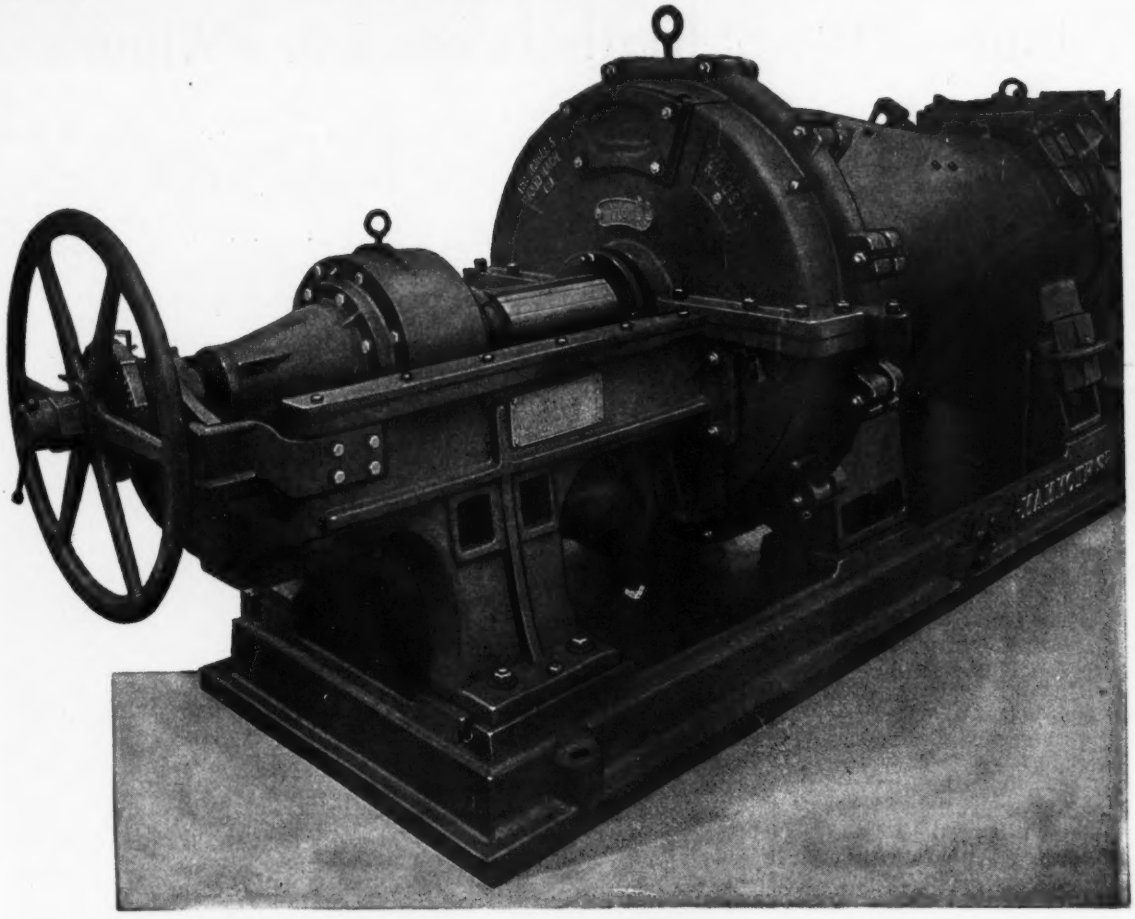
The fine paper lines in general held well during the week with bonds and ledgers in good demand and the sulphite grades also giving a good account of themselves. Books and covers were improved with local jobbers quite outspoken about higher prices in the next few weeks. Paperboard offices are out to make 1937 a record year with a most satisfactory first six months to serve as the basis for genuine optimism. Krafts are strong. Newsprint and ground wood markets are characterized as exceptionally satisfactory. Waste papers are spotty.

Business Improves

The paper and printing business in the seventh federal reserve district continued to improve on May 15 as compared to the period ending April 15 according to a compilation of figures on business in Michigan, Wisconsin, Iowa, Indiana and Illinois. The 619 reporting firms listed 81,118 wage earners on May 15, an increase of 1.9 per cent in number over April 15. These same firms reported earnings of $2,409,000 which is an increase of 3.5 per cent over the preceding month's report. The industry also compared favorably with others in the industrial group which reported an increase of 1.4 per cent in wage earners and of 2.8 per cent in earnings as of May 15 compared with the week ending April 15.

S. D. Warren Co. Advertising

In keeping with past productions, the S. D. Warren Company gets a hand from local paper buyers with its latest mailing, "Mrs. Wilson Ignores Some Important Advertisements." The little treatise on the value of advertising well presented, prefaces some practical suggestions for achieving good reproduction in booklets, folders, trade publications and in magazines. The suggestions are printed on English finish and Supercalendered papers. The final pages carry sheets illustrating different shades of white paper with the bright white sheets labeled as the new shade of Warren's New England English finish. The Chicago Paper Company is the local distributor of Warren papers.



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Noble & Wood Jordans are made in eight sizes from the Mastodon, with a capacity of 100 tons and up, to the Baby (Laboratory size), with a capacity of 5 tons. These Jordans are heavy, sturdily built engines, capable of treating a wide variety of stock from rags to corn stalks.

Noble & Wood Jordans are running in mills making every kind of paper from news or roofing to the finest bonds and book papers.

These Jordans can be furnished with either plain or anti-friction bearings, belt driven or direct connected to motor. Plugs—either banded or bandless type.

Let us quote you on your next Jordan.

NOBLE & WOOD MACHINE CO.
HOOSICK FALLS, N. Y.

Abitibi Must Start Its Long Idle Properties

Company Must Have Mills At Espanola and Sturgeon Falls In Production In Three Years or Its Assets In the Enterprises Will Be Put Up For Sale — Canadian Paper Box Manufacturers Ass'n Meet June 22-23.

[FROM OUR REGULAR CORRESPONDENT]

TORONTO, Ont., June 28, 1937—Under an agreement completed this week by the Hepburn Government and the Abitibi Power and Paper Company, now in process of reorganization, this concern must have its long-idle plants at Espanola and Sturgeon Falls in production at the end of three years, or its assets in the enterprise—timber limits, power and other operating rights—must be put up for sale.

Announcement to this effect was made by Hon. Peter Heenan, Minister of Lands and Forests, one of the signatories to the agreement, who for more than a year has been actively identified in the capacity of Government "watch-dog" with the reorganization.

The Government is not stipulating the type of production demanded at Espanola and Sturgeon Falls—it may be newsprint, or pulp, or some other product altogether—but it does want the wheel of industry turning again there with all possible speed, in order that the most advantageous use possible may be made of Ontario's great timber reserves, and the employment of more men in bush operations may be assured. Any time prior to the expiration of the three-year time limit, the Government, if it deems it advisable, may recall the rights it has advanced to Abitibi and locate new industries in the idle plants.

Another feature of the agreement, provides for the acquisition by the Hydro-Electric Power Commission of the company's Chrystal Falls power development. This is being turned over to take care of certain indebtedness of the company to the Province in the way of timber dues and other obligations. Power from the development, Premier Hepburn stated, will be used in Sudbury. Hydro has the necessary transmission line now in course of construction.

Certain reductions in the old timber limits of Abitibi have been made under the agreement, Mr. Heenan stated, but ample pulpwood will always be available to the company, he stated, to ensure capacity production in all its plants. The Province, Mr. Heenan stated, has only interested itself in the long and cautious reorganization to the extent of the Crown timber limits involved and with the conviction, shared by all the Government, that every possible assistance should be given to re-establish industry with a firm foothold wherever possible in the North country.

Box Makers Hold Convention

Delegates to the number of 163 attended the twenty-second annual convention of the Canadian Paper Box Manufacturers Association at the Seigniory Club on June 22-23 and participated in the most successful annual event the organization has yet held. In the discussion that took place on various aspects of the industry there was an optimistic note and it developed that the box plants had had a busy year and that a similar one was in prospect for 1938. Allen Manchester, of Manchester-McGregor, Ltd., Toronto, was elected president; H. G. Turnbull, of National Paper Goods, Ltd., Hamilton, vice-president and H. V. Hadden, Toronto, managing secretary. Directors elected were: R. P. Reid, Canadian Lithographing Co.; G. W. Brown, Gair Co. of Canada, Ltd.; J. G. McDiarmid, Somerville Paper Box Co., London; L. P. Morrison, Toronto. During the session Mr. Morrison was presented with a testimonial of appreciation of his services as president during the past two years.

Business and entertainment were pleasantly intermingled in the program and there were only two major addresses, one by A. G. Ballenberg, treasurer Morris Paper Mills, Chicago, on "Order Analysis," and the other by Alan S. Cole, vice-president and general manager Breskin & Charllon Publishing Co. Corporation, New York City, on "Laying the Groundwork for Package Design." Some lively discussions followed the papers.

In the entertainment line there were bridge contests, aquatic sports and golf. A. E. Long & Co. won the Fielder golf trophy and the Hind & Dauche horseshoe pitching trophy was won by I. Good and H. Logan.

Death of A. T. Brown

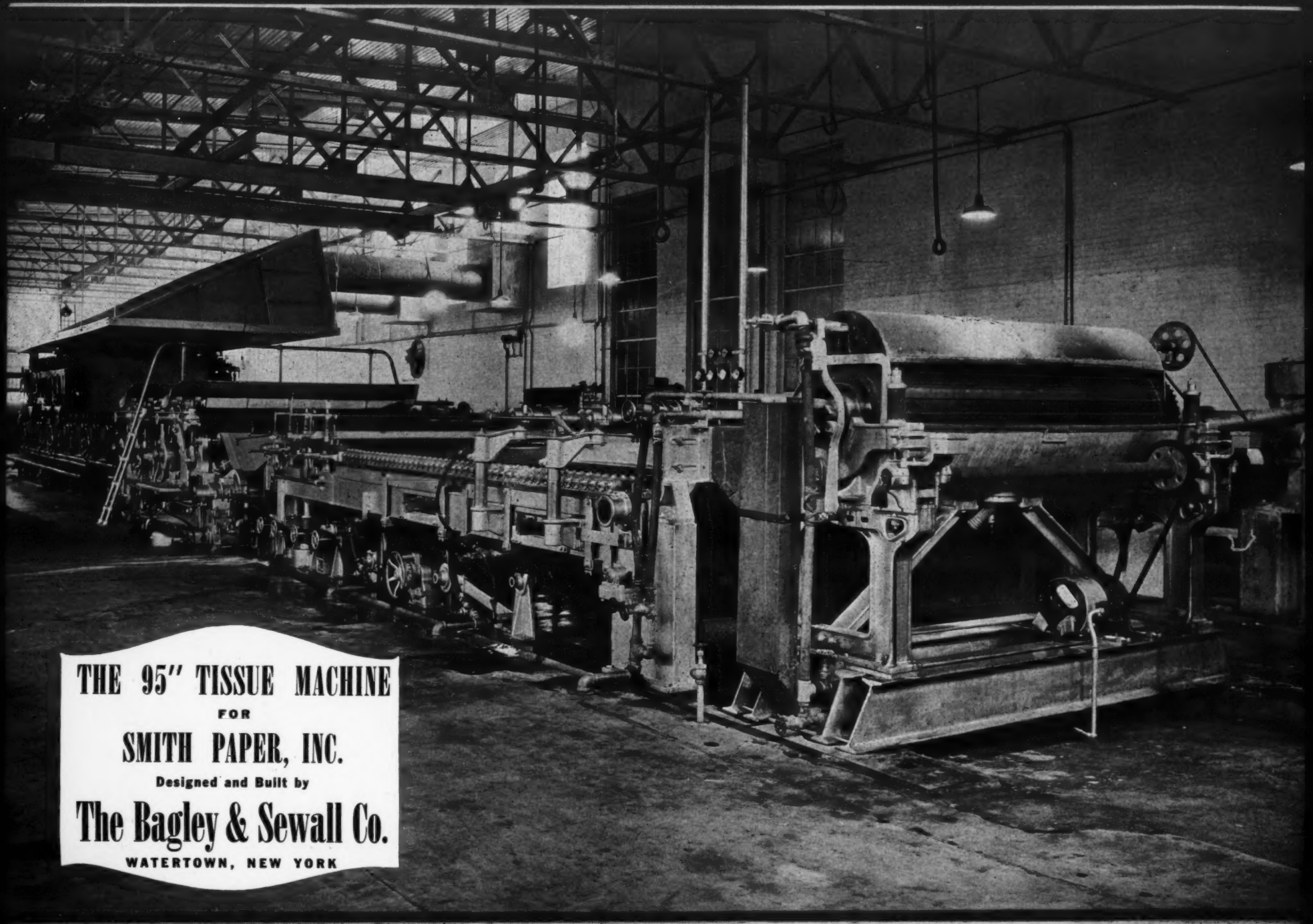
After a lingering illness death came this week to a man widely known in the Canadian paper industry in the person of Alexander Taylor Brown, general manager of the E. Pullen Paper Stock Co., Toronto. Deceased was in his fifty-sixth year and was born in Scotland, coming to Canada 30 years ago. Past president of the Ontario Pulp and Paper Safety Association he was a member of the Toronto Board of Trade, the Empire Club and the Canadian Club. He was at one time purchasing agent for the Salvation Army.

Dr. Karlson Goes to Hudson Falls

APPLETON, Wis., June 28, 1937—Dr. Karl R. Karlson, resident manager, A. W. Agrell, superintendent, and nine others who were connected with the Union Bag and Paper Company's mill at Kaukauna, Wis., have been transferred to the company's mill at Hudson Falls, N. Y., following the discontinuance of the Kaukauna mill June 16. Six others have been engaged by the Thilmany Pulp and Paper Company at Kaukauna, and two by the Combined Locks Paper Company.

Equipment used to make specially processed paper produced only at Kaukauna has been moved to Hudson Falls, including super calender stacks, the washer and drier, the rewinders and the embosser. The remainder of the equipment will remain at Kaukauna.

Dr. Karlson reports that several mill operators have called to look over the plant since announcement of its abandonment, but have not expressed definite intentions to buy or rent the property. The mill had operated continuously since 1874, when its location was chosen because of its water power. It produced the paper used in the company's bag plants.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WATERTOWN, NEW YORK

Financial News of Pulp and Paper Industry

Plan For Change In Capitalization of International Paper Co. Is Approved By Large Majority of Shareholders — SEC To Hear I. P. Plan July 15 — Kimberly-Clark Stockholders Ratify $20,000,000 Bond Issue.

New York Stock Exchange
High, Low and Last for the Week Ending June 30, 1937

	High	Low	Last
A. P. W. Paper Co.	7⅛	7	7⅛
Armstrong Cork Co.	62½	59¼	62
Celotex Corp.	43⅞	42	42¼
Celotex Corp. pf.	78	76½	76½
Certain-Teed Products Corp.	13½	12⅜	13
Certain-Teed Products Corp., pf.	56	50½	52
Champion Paper & Fibre Co.	60½	57	57
Champion Paper & Fibre Co., pf.	109	107½	107½
Congoleum Nairn Co.	36½	34	36
Container Corp. of Amer.	29⅞	27½	28½
Continental-Diamond Fibre Co.	19	18⅜	19
Crown Zellerbach Co.	18¼	16⅜	18
Flintkote Co.	29½	26½	27½
International Paper & Power (a)	17¾	16½	17¾
International Paper & Power (b)	12½	11⅜	12
International Paper & Power (c)	6⅞	6⅝	6⅜
International Paper & Power pf.	104½	95	99
Johns-Manville Corp.	126¼	124	126¼
Johns-Manville Corp., pf.	123¼	123¼	123¼
MacAndrews & Forbes	31¼	31¼	31¼
Masonite Corp.	50½	48½	48½
Mead Corp.	27	26	26½
Mead Corp., pf.	95	95	95
Paraffine Companies, Inc.	64½	61⅞	62
Scott Paper Co.	40½	39½	40
Sutherland Paper Co.	32	31⅝	31¾
Union Bag & Paper Corp.	74¼	72	73
United Paperboard Co.	10	9½	9¾
U. S. Gypsum Co.	110	106	107
U. S. Gypsum Co., pf.	163	162	163

New York Curb Exchange
High, Low and Last for the Week Ending June 30, 1937

	High	Low	Last
American Box Board Co.	20	19⅛	19⅛
Brown Co., pf.	77	74	75
Great Northern Paper Co.	39½	39	39
St. Lawrence Corp.	11	11	11
St. Regis Paper Co.	8	7⅛	7⅛
St. Regis Paper Co., pf.	104	99¾	104
Taggart Corp.	11½	10¼	10¼

New Set-Up for I. P. Approved

Boston, Mass., June 28, 1937.—Richard J. Cullen, President of International Paper and Power Company, made the following statement after the annual meeting of the Company here last week.

"I am glad to announce that the Plan for Change in Capitalization has been approved by a large majority of every class of our shareholders. The favorable vote of each separate class of stock amounted to more than two-thirds of the total outstanding shares of each class. The vote by classes was as follows:

	Shares Entitled To Vote	Shares Voting for the Plan	Shares Voting Against the Plan
7% Preferred	913,026	642,148	61,790
6% Preferred	3,717	2,497	112
Class A Common	832,749	605,432	6,784
Class B Common	821,958	725,596	4,400
Class C Common	2,122,620	1,684,961	50,552

"There has been some opposition. At the meeting today, objection to the Plan was expressed by small minorities of both preferred and common shareholders, the common minority asserting that the Plan favored the preferred shareholders to the detriment of the common shareholders and the preferred minority asserting that the Plan favored the common shareholders to the detriment of the preferred shareholders.

"The directors reached the conclusion nearly a year ago that an opportunity existed for both the preferred shareholders and the common shareholders to strengthen their respective positions by cooperating to put the capital structure of the Company on a sound, well-balanced basis. After months of study and after consideration of a number of different proposals, a committee of directors formulated the Plan for Change in Capitalization on which the shareholders have just voted. As stated in the letters which we sent to our shareholders, it has been the unanimous opinion of our directors that the Plan was fair and that its adoption should prove beneficial to all classes of shareholders, both preferred and common. It has been gratifying to learn that the holders of such a large majority of our shares agree with us.

"In its report on the Plan, the Securities and Exchange Commission announced that after the shareholders' meeting, a further hearing would be had on the Company's application for an order exempting the Company from provisions of the Public Utility Holding Company Act of 1935 in regard to the securities to be issued pursuant to the Plan. Final action by the Board of Directors to make the Plan effective will not be taken until such an order is granted.

"No definite statement can yet be made as to when this action can be taken, but under the most favorable circumstances, it would not seem possible to have the new stock certificates ready for distribution before September."

International Hearing Due July 15

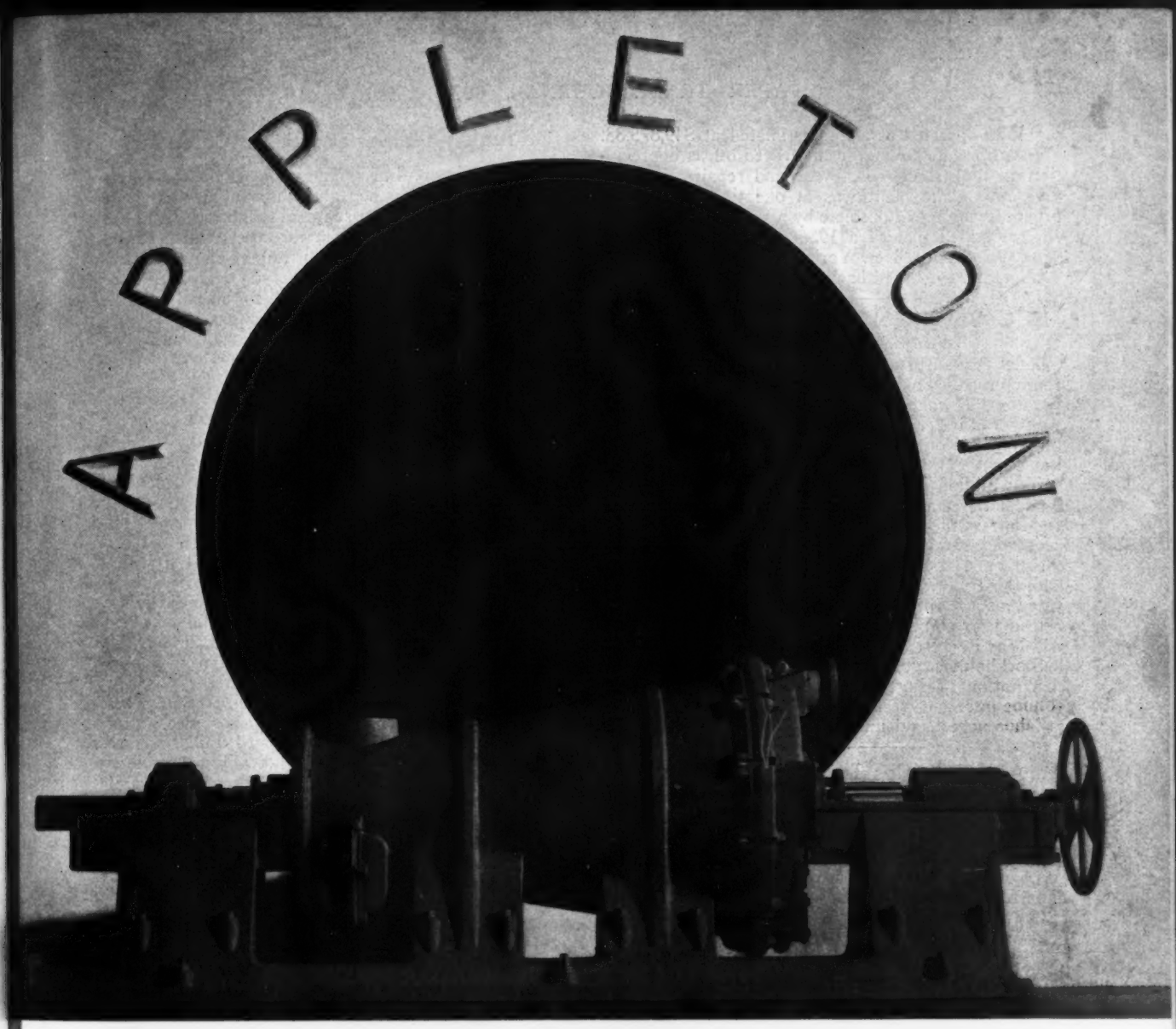
WASHINGTON, June 26, 1937—Securities and Exchange Commission called today a hearing for July 15 on the reorganization plan of International Paper and Power Company, whose stockholders approved the plan last Wednesday.

Union Bag Shows Loss at Hudson Falls

[FROM OUR REGULAR CORRESPONDENT]

HUDSON FALLS, N. Y., June 26, 1937—Testimony that the Union Bag and Paper Company had lost considerable money while operating its plant here in 1936 ended certiorari proceedings this week brought by the concern against this municipality to demonstrate why tax assessments against the paper company should be reduced. The company contends that the present assessments on its property are excessive and discriminatory besides making it difficult to operate in this village at a profit. Supreme Court Judge Erskine C. Rogers, hearing the proceedings in chambers here, remarked that the case was important not only to the industry but to the village taxpayers and requested both sides to attempt an agreement. A few hundred of the residents are still employed in the local plant despite the fact that the concern is concentrating a large portion of its manufacturing activities in the South.

Lawyers for the concern and village adjourned for a short conclave this week and reported no agreement could be reached. Consequently, Justice Rogers then set July 10 as the date for brief to be filed by both sides, providing an amicable settlement is not reached before that time. John Porter of New York City, assistant secretary of the paper concern in charge of costs and accounting, testified that the local plant dur-



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ing 1936 operated at a loss estimated at $49,875.38. He said $94,497.50 had been written off as depreciation on the property last year and repairs had cost $77,936.75. The plant was at one time during the proceedings termed obsolete by a witness. Mr. Porter further stated that of a 1936 operating cost of $1,070,079.35 for the New York office the sum of $595,000 had been charged back to the plant here.

K. C. Stock Holders Ratify Bond Issue

[FROM OUR REGULAR CORRESPONDENT]

APPLETON, Wis., June 28, 1937—Preferred and common stockholders of the Kimberly-Clark Corporation, Neenah, Wis., at a special meeting last week, ratified the recent action of the board of directors in voting a $20,000,000 first mortgage bond issue.

Ten million dollars' worth of bonds will be sold immediately, part of the proceeds to be used for refunding of the corporation's first mortgage five per cent gold bonds, series A, presently outstanding in the amount of $5,318,000, and the balance to provide additional working capital. The new bonds will be dated as of June 15, 1937, will be designated as fifteen year sinking fund bonds, series of 1937, and will bear interest of 4¼ per cent.

Stockholders were informed by the officers of the corporation of a general slackening off in business volume in recent weeks, which they attributed chiefly to labor unrest and uncertainty as to the future.

Aetna Settles Income Tax Claim

[FROM OUR REGULAR CORRESPONDENT]

DAYTON, Ohio, June 28, 1937—The Aetna Paper Company of this city has settled for $48,779.85 an income tax claim amounting to $255,543 and which was levied against it by the Bureau of Internal Revenue for the year, 1932.

The settlement was reached following a two-year fight over the claim.

The United States Board of Tax Appeals, to which the paper company had carried its protest against the levy, affirmed the settlement and dismissed the case.

The basis for the claim of the Revenue Bureau was its contention that the Aetna Company had withheld distribution of profits in order to save shareholders from being taxed on such distribution.

In its appeal the company had attacked the constitutionality of the section of the revenue law under which the tax was levied.

The details of the considerations which brought about the compromise were not announced.

Champion Fibre Reports Income

The Champion Paper and Fibre Company reports for the fiscal year ended April 25 net profit $1,753,408; for year ended April 26, 1936, net income of $1,207,389 before deducting minority interest of $46,237 in income of Champion Fibre Company represented by dividends on its preferred stock.

Geo. W. Millar & Co. Pay Bonus

The officers, directors and stockholders, of George W. Millar & Co. have declared two weeks' bonus to their employees—two weeks' salary, the equivalent of one week to be paid June 25th and the second week December 24th.

Finnish Timber and Paper Calendar

After an interval of about two years the publishers of the Finnish Timber and Paper Calendar have found it necessary to issue a new edition, the sixth in succession, of the popular directory, which covers all the various sections of the trade. The new addition has also been edited by Onni O. Ojala, editor of the Finnish Paper and Timber Journal, in collaboration with other experts of the trade. It goes without saying that Mr. Ojala has again succeeded in making the new edition a great success both in regard to the variety of items dealt with and the very clear presentation of the material. He is, therefore, to be cordially congratulated on the result.

The "General Section" gives information on Finland, her forests, economic conditions, banks, railways, etc., as well as data on the various organizations within the woodworking industries. A table shows Finland's total exports and imports of the most important products for the years 1921 to 1936, and the average figures for the years 1911 to 1913. Then follows the "Sawmill Section" with a wealth of particulars of practically all the country's sawmills. It appears that several changes have taken place since the previous edition was published, in that no fewer than about 60 new enterprises appear in this edition. The third section deals with the plywood and spool industries, and the fourth section gives an excellent survey of the cellulose, paper, mechanical woodpulp, cardboard and wallboard mills. Here also recent changes are noted, indicating alterations in management, share capitals, plants, etc. Several tables show the volume of shipments of the various products.

The fifth section contains various contract forms in use for shipments of sawn goods, pit props, plywood, pulp and paper, and the sixth section gives all necessary information about shipping marks and a table showing the sawmills according to shipping districts and ports.

This section further includes an interesting review of the country's cellulose, paper and mechanical woodpulp mills, according to the products made in various mills.

It may be further mentioned that this new edition, like its predecessors, is duly authorized by the various central organizations and selling associations. The price of the Calendar abroad is 12s., net, and may be ordered either from the booksellers or from the office of the Finnish Timber and Paper Calendar, Alexandersgatan 36 B, Helsingfors. Obtainable in U. K. from Stobart & Son, Cathedral House 8-11, Paternoster Row, London E.C.4.

Union Bag Earns $600,000 First Half

The Union Bag and Paper Corporation is expected to earn around $600,000 in the first half of 1937, according to an estimate made by Alexander Calder, president. This would compare with profits of only $387,391 for all of last year, and almost duplicate a peak profit of $682,405 for the year 1934, Mr. Calder said.

"The profit in the first half of this year was made with one unit of the company's Savannah mill in operation. During the second half year there will be two units operating during the entire period, and three units during the last quarter," Mr. Calder said.

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Development of the Fourdrinier*

By H. G. McDowell[1]

My subject is primarily "The Development of the Fourdrinier," but I will digress temporarily to recount the manufacture of paper in the closing years of the nineteenth century, the period immediately preceding the invention of the paper machine. I will also include a historical resume.

A very few small mechanical devices had, from time to time, been introduced into the mills, mildly to increase their efficiency. But the vat men continued to dip the pulp into molds and shake out the water until the sheet was formed, and the sheets continued to be hung separately on rods in the lofts to dry. The size of the sheet was of necessity limited and was determined by the size mold which the paper maker could handle.

The principal mechanical device was a beating engine called the hollander, probably so called from the supposed country of its origin. The hollander reached a state of perfection whereby pulp could be prepared in larger quantities than could be utilized in ordinarily equipped mills, with the vat men working only by hand. A faster method of transforming pulp into paper, therefore, became an economic necessity. In other industries machinery had been introduced with promising results and the advantages that should accrue from its adoption in paper manufacture could be safely predicted. Machines were needed to supplement the hollander, and naturally they came—the fourdrinier first, ten years ahead of the cylinder machine.

The First Machines

The paper machine has not, like the steam engine or locomotive, gone forth in a comparatively finished state from the brain of one favored man. As in all other evolutionary steps in the arts and sciences, it is impossible to state definitely what paper maker first conceived the forward step which manifestly lay in devising equipment which would produce paper in an endless sheet. However, the honor of being first to obtain a patent is generally credited to Nicholas Louis Robert of France who obtained a patent in the year 1799.

Information regarding Robert's machine is very meagre. He constructed a working model but the results obtained were not satisfactory and he sold his patent to one Didot, his employer, a paper manufacturer in France.

Didot and his brother-in-law, John Gamble, who became interested, went to England and took out patents there. They entered into arrangements with Henry and Sealy Fourdrinier, wholesale stationers, who financed the invention in England. With them Bryan Donkin, a practical mechanic, was associated and he made improvements on the original, a new machine being patented in 1807 by the Fourdriniers and John Gamble and first built in 1808. In principle it was the Robert machine, but in design it was far in advance of that.

The Fourdrinier brothers spent more than 60,000 pounds Sterling experimenting and improving the machine and in consequence thereof were forced into bankruptcy. With them Didot and Gamble were ruined. In 1840 a grant of 7,000 pounds was made to the Fourdriniers and that, with the distinction of having the machine forever known by their name, was all that ever came to them for their labors and expenditures.

A few years ago The World's Paper Trade Review published in plan and elevation a reproduction of the original drawings of the machine patented in 1807 by the Fourdrinier brothers and John Gamble. The drawings were necessarily reduced in scale and are, therefore, not quite distinct or understandable. However, if I have interpreted them correctly, the stuff flowed directly from the stuff chest to a wooden vat equipped with two revolving agitators. The volume of stock flowing on the wire was apparently controlled by an adjustable gate in the breast roll end of the vat, and flowed down an inclined copper trough onto the wire, being delivered to the wire at a point somewhat beyond the breast roll. "Ruler bars" are shown each side of the wire in addition to deckles carried in small pulleys. No upper couch roll was used. Presumably there was a "save-all" under the wire for on the back side of the machine there is a revolving wheel with buckets marked "back water lifter". Shake apparatus is shown—who knows but that it may have been of the variable speed and adjustable throw type?

There is no information available as to what major changes were made in the design of the original fourdrinier, except that in 1811 a top couch roll was installed, and in 1812 a patent was granted for covering the top couch with a woolen jacket. In 1821 the first patent for a dandy roll for producing laid lines on paper was granted.

We must turn the pages of paper machine history over rapidly for we have arrived at the year of 1829 and find America is building her first fourdrinier paper machine. I regret that I have been unable to obtain a description of this machine.

For quite a number of years after the building of the first fourdrinier in America, little progress was made in improving its design, but there was a gradual increase in the size of the wires. Until 1867 the widest machine was not over 100 inches.

That you may have an idea what the 1867 vintage fourdrinier looked like, I have with me a very good illustration of the first paper machine built by The Pusey and Jones Company. It was installed in the Rockland, Del., mill of The Jessup and Moore Paper Company and carried a wire 86 inches wide, 40 feet long. Incidentally this machine is still in operation; it has, however, at various times undergone considerable changes so that at present very little of the original machine remains.

Time marches on and an American paper manufacturer has become speed and width conscious. In 1887, twenty years after the Rockland machine was built, Warren Curtis, Sr. of the old Hudson River Pulp and Paper Company ordered a newsprint machine with a wire 110 inches wide and 50

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* Presented at the meeting of the Delaware Valley Section of the Technical Association of the Pulp and Paper Industry, Philadelphia, Pa., February 26, 1937.

[1] Member TAPPI, Engineer, The Pusey and Jones Corporation, Wilmington, Del.

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Nashua, New Hampshire

feet long, designed for a speed of 250 feet per minute, because as he expressed it, he wanted paper makers to sit up and take notice. It was the widest and fastest machine in existence at that time and was built by The Pusey and Jones Company.

Limitations of time preclude the possibility of my enumerating all the improvements that have been made in fourdrinier design, therefore I shall limit my discussion to the shake, the suction couch roll and the removable fourdrinier.

As widths and speeds progressively increased, the mechanical limitations of existing designs became apparent. Innumerable patents, many of them not workable, were granted to paper makers and machine builders. Substantial progress, however, was made in improving the fourdrinier despite the difficulties under which designers and machine builders labored. Their path was indeed thorny for they were handicapped by prejudices of paper makers, limitations of materials and inadequate shop facilities. In the early days it required close contact with a paper mill for a designer to qualify as such for until 1873 when Carl Hofmann published his book, "A Practical Treatise on the Manufacture of Paper", there was no technical information of any real value available. Except possibly for the application of anti-friction bearings for rolls and the use of pumps, both of which were common to other industries, practically everything designed for the fourdrinier was proprietary.

The Shake

I mentioned in the beginning that the original fourdrinier was equipped with a shake, for the purpose, no doubt, of imitating the motion given the mold by the hand paper maker, and through the ages paper makers have considered it necessary to shake the wire in order to obtain the proper sheet formation. Carl Hofmann, to whom I have previously referred, says:

"It is this shaking movement, though it is very trifling (about ¼ inch), which makes the fourdrinier paper superior to that made on a cylinder machine. While without it, the fibers would only be laid parallel in the direction in which the wire runs, this cross motion makes them intertwine themselves in all directions, so that they will be felt as completely as hand-made paper.

It is evident that the structure and strength of the paper depends to some extent upon this movement, but only experience can teach what speed and length of shake should be used for a certain kind of stock and paper.

The shake must be regulated so that as much water as possible will have escaped through the wire before the paper reaches the suction boxes; but, as the fibers will only felt themselves as long as they are suspended in water, it must also be prevented from leaving too soon. A tumbler full of water swung around very fast in a hoop reaches often a position in which it is upside down, without falling, and even without losing a drop, the circular motion being so intense that it overcomes the weight. This is exactly what fast shaking will do; the pulp is moved sideways so violently that the tendency of the water to fall through the meshes is checked. The shaking is strongest at the breast-roll and less as the wire advances, so that, even with a rapid movement, a free pulp will find time and room enough to discharge its water.

It is necessary that the speed as well as the length of the shake-movement may be quickly changed."

It was not until American and Canadian newsprint machines were built to operate at a speed of approximately 1000 feet per minute that any fourdrinier was constructed without a shake. The majority of European high speed machines, while possibly not attaining the speeds of machines on this side of the Atlantic Ocean, are equipped with a shake. Its importance will no doubt provoke some argument, but it is my thought that when a shake has been designed sufficiently rugged to serve a wide high speed newsprint machine, there will be a market for it because the demand for clearer illustrations in newspapers is in the offing.

That I may recount typical illustrations of the evolution of the shake, I have referred to the various shakes developed by The Pusey and Jones Company during its corporate life because they are the only ones of which I have complete information regarding epochal changes in design. Therefore, if it seems that I am indulging in advertising, I hope you will bear with me. I shall first describe shake heads or shake actuating mechanism.

The earliest type was called the "Monumental", probably from the fact that an ornamental column was used to house the shake actuating mechanism, comprising a vertical shaft contained in the center of the column, a pair of bevel gears located at the base of the column, a fly wheel with crank pin attached and a pulley on the horizontal shaft for driving purpose. The crank pin was adjustable in its throw from zero to ⅝ inch eccentricity. Power was applied to the shake frame by means of a connecting rod between the crank and a pin attached to a vertical extension of the back shake post. The connecting rod was placed high enough for a man to walk under it. The plain pulley was later replaced by step pulleys to vary the speed. They in turn were replaced by cone pulleys.

The next development was a modification of the "Monumental". The bevel gears were replaced by a pair of bevel friction wheels to produce variable speed, and a short connecting rod was used to connect the crank with a rocker shaft to which was attached a slotted crank fitted with a pin on a sliding block contained in the slots. The block was controlled by a hand wheel and its position determined the amount of throw. Between the sliding block pin and the shake frame extension there was a connecting rod.

The next type was the horizontal shake head. It was low and compact, gearless and equipped with a wide face cone pulley for speed variation and a friction clutch for starting and stopping purposes. A crank pin adjustable as to amount of "throw" when the shake head was not in motion was attached to a fly wheel, and a short vertical connecting rod connected the crank pin with a low horizontal arm extending from the back shake post.

The shake head described above was later modified to accommodate a change in design of the shake frame which required a straight horizontal connecting rod between the crank pin and the

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THE answer in most cases is moisture content . . . stock that is not seasoned for atmospheric conditions, then buckles and curls after it leaves the mill. Present day printers demand flat-lying stock, and the mills who are supplying it enjoy a decided sales advantage.

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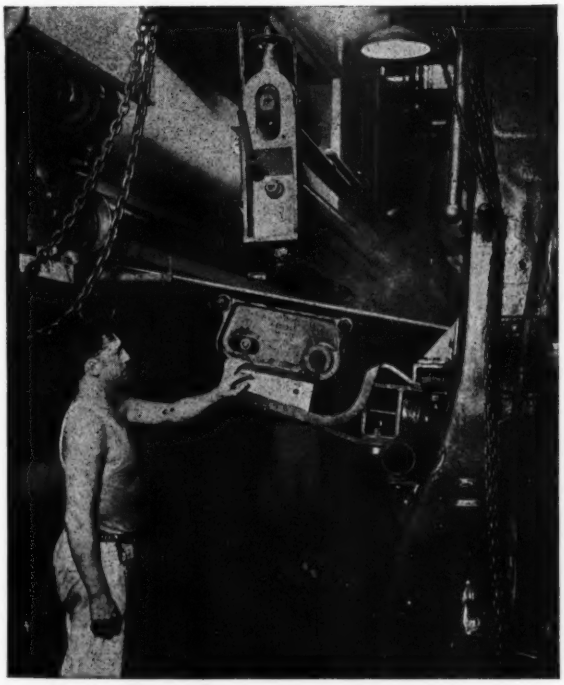

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shake frame. The essential features including the cone pulley and the friction clutch were, however, retained.

The next development was the present day type in which the variable speed is obtained by connection to a d. c. electric motor. The amount of "throw" can be varied without stopping the machine. The mechanism to produce the adjustable throw is somewhat complicated but nevertheless efficient.

The Shake Frame

I shall now describe the evolution of the shake frame supporting the breast roll and the shake rails. A good idea of the earliest type can be obtained from the illustration of the "Rockland" machine. The front and back shake posts were each supported by a hinge pin casting bolted to the foundation plate and the posts were connected by a cross bar close to the breast roll so that both posts would move as one unit. The back post had an arm extending vertically upward to which the shake head connecting rod was attached. The shake rails beyond the shakeposts were supported by vertical columns resting in modified type cup bearing castings attached to the foundation plates.

The next type was similar to the earliest type, except the back shake post was made in the form of a bell crank with an arm extending horizontally outward, to which the shake head connecting rod was attached.

The next improvement was called the "Savery Shake" and derived its name from the inventor, the late Thomas H. Savery, Sr., who patented it in 1895. Its feature which is represented by the model consisted of a rigid cast iron "U" frame, the upturned ends of which formed the front and back shake posts supporting the breast roll and the ends of the shake rail. The shake posts moved horizontally and in unison through the lower portion of the "U" frame which was carried by double links front and back supported in fulcrum feet. The fulcrum feet rested on the foundation plate and were tied together by a rigid connection between them. The method of supporting the remainder of the shake rails was practically the same as the previous design.

A few years later the "Savery Shake" was improved by the introduction of buffer springs, located at the front and back of the "U" frame with lug connection between the fulcrum feet tie bar to which they were attached and the "U" frame. The buffer springs served to check the extreme throw or shaking movement of the "U" frame. There was also included a spring attached to the horizontal bell crank arm connecting with the shake head, which served to counterbalance the weight of this arm. This type of shake remained in use for many years; in fact there are machines in operation today equipped with it.

The next improvement was in 1901 when the "New Century" shake, also patented by Mr. Savery, was introduced. The limitations of existing shakes became apparent as the width and speed of fourdriniers progressively increased, for the burden placed upon the rocker arm pins and the shake rail supporting columns was such that frequent replacements were necessary. The "U" frame and the buffer spring features of the "Savery" shake were retained, but the double link and pin arrangement was replaced by vertical refined iron flat springs, rigidly bolted at the top to the upper end of the "U" frame, and at the bottom to a cast iron brace or cradle fastened to the foundation plates and extending across the machine. The shake rails were trussed, thereby eliminating the conventional column supports. The shake was an innovation in that by slackening the upper bolts of the flat springs, the "U" frame and all other parts dependent upon it could be raised or lowered by means of heavy setscrews, thereby making it possible to give either an upward or downward inclination to the wire, a feature not possible with any previous type fourdrinier.

Other Improvements

Newsprint paper manufacturers soon grasped the possibilities of a downwardly inclined wire as a means of obtaining higher speed without lengthening the wire, and it became the general practice to raise the breast roll 6 inches above level, the limit of the "U" frame adjusting screws. It happened, however, that a machine tender named Eibel conceived the idea that a greater inclination or pitch would be more beneficial, therefore he placed blocks under the shake frame to increase the height of the breast roll more than 6 inches. Finding the results satisfactory, he had the idea patented, and demanded royalty from others who followed in his footsteps. The matter was taken to the courts of several states and the decisions were against Eibel, but he appealed to the Supreme Court, which reversed the decision of the lower courts and declared the patent valid, finding that at the time Eibel applied for his patent no one had ever raised a fourdrinier as high as he did.

The flat spring principle for supporting the shake frame is incorporated in practically all modern fourdriniers, the number of springs used depending on whether single or multiple shake rails are used. There is a type available for every purpose and they may be had in combination with a raising and lowering device by means of which the pitch of the wire can be readily changed to suit manufacturing conditions and different weights of papers.

The suction couch roll had its origin abroad but its perfection is a tribute to American ingenuity. The first successful installation in America was made in 1908 on a machine making grease-proof paper. The roll was designed and built by the Sandusky Foundry and Machine Company, of which W. H. Millspaugh was president and from whom it derived its name. The suction roll continued to gain favor, for the upper couch roll of the conventional arrangement had always been a source of trouble and chiefly responsible for frequent wet end breaks. In addition the water content removal of the sheet was increased, and as a result it was possible to increase the machine speed without adding more driers or increasing the burden on existing dry parts.

The first machine to be equipped with a removable fourdrinier was built in 1914. The fourdrinier was divided into several sections which were separately rolled to the tending side space when the wire was to be replaced. In 1921 the first completely removable fourdrinier was installed, by means of which the entire fourdrinier from the breast roll to the wire guide roll inclu-

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sive could be moved as one unit outwardly to the tending side space. The advantages of this type are obvious for a wide machine, of which the breast roll, table rolls and other parts, necssarily removable when changing wires, would be so heavy that they could not be man-handled without the use of a crane, entailing a damage hazard and considerable loss of time.

The fourdrinier, with its principle unchanged, has survived a span of nearly 130 years. How long it will continue to survive depends on inventive genius, but the world is just as skeptical today as it was in 1799 when it practically said to Nicholas Louis Robert, the prophet and inventor, "it can't be done."

E. Mahler Gets Degree From Brown

[FROM OUR REGULAR CORRESPONDENT]

APPLETON, Wis., June 28, 1937—One of the ten prominent persons awarded honorary degrees at Brown University, Providence, R. I., during the commencement exercises Monday, June 21, was Ernst Mahler, executive vice-president of the Kimberly-Clark Corporation, Neenah, Wis. He was awarded the degree of doctor of science.

The honor came to the internationally known chemical engineer through his many years of association with Dr. Henry Merritt Wriston while president of Lawrence College, Appleton, Wis. Dr. Wriston became president of Brown University on February 1 of this year. These two men were the founders of the world famous Institute of Paper Chemistry affiliated with Lawrence College, and Mr. Mahler has been president of its board of trustees since its inception. Dr. Wriston was the director up to the time of his resignation.

President Wriston, on behalf of the board of fellows of the university, delivered the following citation when he placed the honorary degree hood over Mr. Mahler's shoulders:

"By family tradition and training prepared to manufacture paper, you enriched that background with scientific knowledge, a lively imagination, inventive skill, and capacity to work with men. These attributes matured into steadfast loyalty to fundamental research and the integrity of scientific education. Thus you have become a leader in transforming an ancient art through modern scientific processes. Friend of many years, with admiration and affection, by the authority vested in me I confer upon you the degree of Doctor of Science, honoris causa, and admit you to all its rights and privileges."

Mr. Mahler was a native of Austria, where he was born in 1887. He comes from a family of paper chemists. He was graduated from Darmstadt in 1912 with the degree of Diplom-Ingenieur. For the next two years he was a chemical engineer for the Badische Company, American branch of the German Dyestuffs Company.

In 1914, Mr. Mahler became associated with the Kimberly-Clark Corporation, in charge of the chemical laboratory and engineering department. Later he was made executive vice-president.

Mr. Mahler received the gold medal of the Technical Association of the Pulp and Paper Industry three years ago for his contribution to paper chemistry, including the invention of numerous paper products and machinery. He is president of the International Cellu-cotton Products Company, and a director of numerous banks and corporations.

Maryland Paper Men Elect Officers

[FROM OUR REGULAR CORRESPONDENT]

PHILADELPHIA, Pa., June 28, 1937—At the annual meeting of the Maryland and District of Columbia Paper Trade Association, held June 18 at the New Annapolis Roads Club on Chesapeake Bay, Thomas C. Price of Barton, Duer & Koch Paper Company, Baltimore, was elected president.

Vice-presidents elected include Lee D. Mahon of B. F. Bond Paper Company, Baltimore, representing the fine paper dealers, and J. N. Freedman of S. Freedman & Sons, Washington, representing the coarse paper dealers. H. A. Bender of Barton, Duer & Koch Paper Company was re-elected secretary, and W. E. Snyder of the Baltimore Paper Company, Inc., was elected treasurer.

The new executive committee consists of James O. Warner of O. F. H. Warner & Co., Inc., chairman; Wiley M. Baxter, Jr., of Baxter Paper Company; B. W. Gillespie of Whitaker Paper Company; Henry Hock of J. Francis Hock & Company, Inc., and A. Kieswetter of the Antietam Paper Company, Hagerstown, Md.

Mr. Price was named fine paper delegate to the National Association with George Finnan of R. P. Andrews Paper Company, Washington, as alternate.

Among the guest speakers at the business meeting, which was held in connection with the outing, was A. H. Chamberlain, executive secretary of the National Paper Trade Association.

At the combined meeting and outing there was an unusually large attendance. After participating in a crab luncheon there was a program of various sports including golf, tennis and swimming. In the evening a very enjoyable Maryland chicken and soft crab dinner was served.

To Build Spur Track at Brunswick

BRUNSWICK, Ga., June 22, 1937—The Atlanta, Birmingham & Coast Railroad Company has purchased from R. W. Madray, of Glynn county, and H. W. Poppell, of McIntosh county, a small strip of land near Arco, which is desired in the construction of a spur track to the site of the plant of the Brunswick Pulp and Paper Company.

The strip of land is 50 feet wide and runs along the proposed center line of the spur track. While the land was purchased by the A., B. & C., it is understood the other two railroads entering the city will participate in the construction of the spur track.

Algonquin Starts Paper Machine

[FROM OUR REGULAR CORRESPONDENT]

OGDENSBURG, N. Y., June 25, 1937—Activities were resumed this week at the Algonquin Paper Mill after a shutdown of the paper machine for several days in order to make repairs to a shaft and clutch. The parts were sent to a factory in a neighboring city. The other departments of the big mill were operated as usual while the machine was being repaired. The plant is running with day and night shifts and is understood to be booked ahead with orders for some time.

41 UNITS INSTALLED OR ON ORDER SINCE JULY 1935

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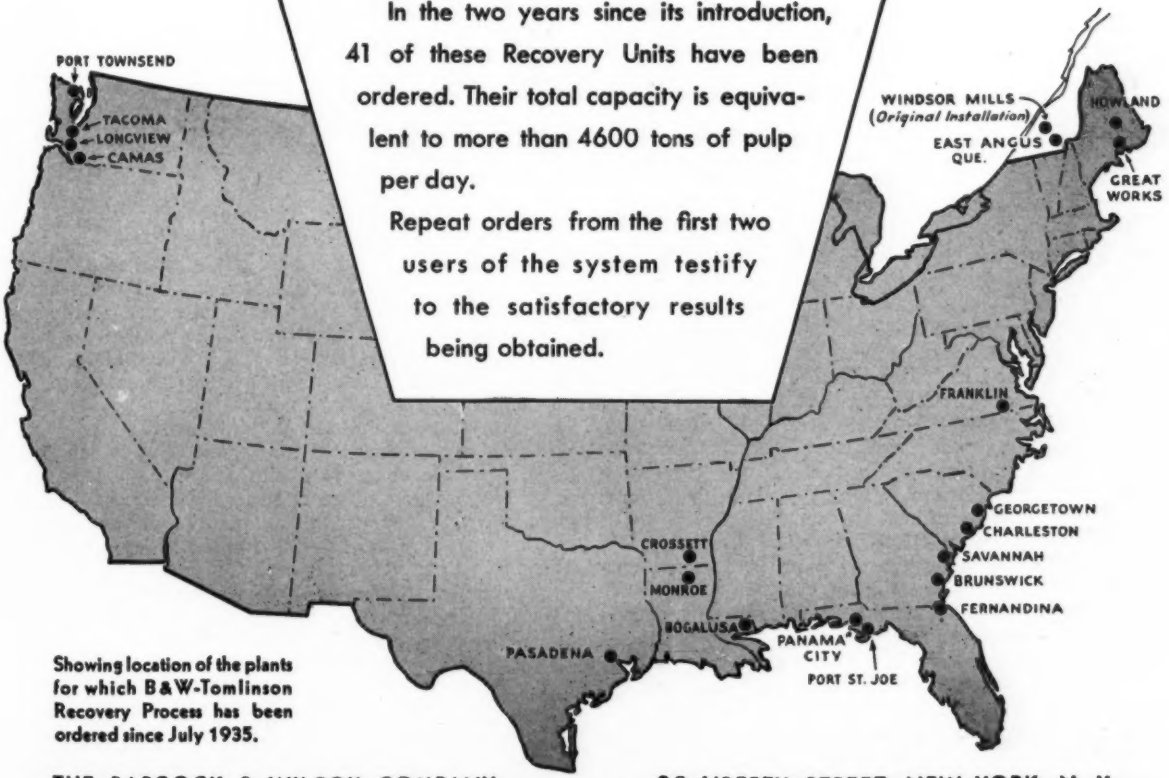
Installations of the B&W-Tomlinson Recovery Process are being made throughout the country at a rate that shows clearly how far this process for recovery of values in black liquor has outstripped the older and formerly standard systems.

In the two years since its introduction, 41 of these Recovery Units have been ordered. Their total capacity is equivalent to more than 4600 tons of pulp per day.

Repeat orders from the first two users of the system testify to the satisfactory results being obtained.



Showing location of the plants for which B&W-Tomlinson Recovery Process has been ordered since July 1935.

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CONSTRUCTION NEWS

A Summary of Vital Facts Regarding Construction, of Pulp and Paper Mills

General Construction News

Clifton, N. J.—The Clifton Paper Board Company, Ackerman avenue, manufacturer of fiber board, chip board and kindred products, has approved plans for new one-story addition to mill, for which superstructure will begin soon. It is reported to cost over $75,000, including equipment. General contract for erection has been let to the Austin Company, 16112 Euclid avenue, Cleveland, Ohio, and 19 Rector street, New York, N. Y. Structural steel framing will be furnished by Joseph T. Ryerson & Son, Woodside avenue, Jersey City, N. J.

Richmond, Ind.—The Johns-Manville Corporation, 22 East 40th street, New York, N. Y., manufacturer of insulating board products, wood fiber specialties, asbestos products, etc., has concluded arrangements for the purchase of mill of the Fibre Conduit Company, Richmond, idle for some time past, following concentration of production of last noted company at Orangeburg, N. Y. Property consists of three main brick and steel buildings, totaling about 150,000 square feet of floor space, with power house and other buildings. New owner will take immediate possession and will make improvements in structures, with installation of new equipment to be placed under way early in July. Large capacity will be carried out. Entire project is reported to cost over $100,000.

Montgomery, Ala.—The Mercantile Paper Company, 108 Commerce street, has arranged for expansion in plant, including increased storage and distributing facilities. Company has taken over four-story and basement building at 116-18 Commerce street, and will remodel and improve at once for company occupancy. General contract for work has been let to the Bear Lumber Company, 100 Tallapoosa street. No estimate of cost announced.

Cincinnati, Ohio—The Clopay Corporation, 1240 York street, manufacturer of paper specialties, has awarded general contract to the Ben Schaefer Building Company, 215 Race street, for proposed alterations and improvements in plant unit, recently referred to in these columns, and work will be placed under way at once. No estimate of cost has been announced. Carl J. Kiefer, Inc., Schmidt Building, Cincinnati, is consulting engineer.

Milwaukee, Wis.—Badger Merchandising Displays, Inc., 3238 North Bremen street, recently organized, plans operation of local plant for the manufacture of folding paper boxes and display containers. Incorporators of new company include H. J. Hanauer and Samuel Goldenberg.

Chester, Pa.—The Scott Paper Company, manufacturer of tissue papers, has plans maturing for large new addition to mill, to be equipped for considerable increase in present capacity. It will be of one-story type, 60 feet high, and is reported to cost over $1,000,000, including machinery. Bids will be asked soon on general contract. The Stone & Webster Engineering Corporation, 49 Federal street, Boston, Mass., is consulting engineer.

Pearisburg, Va.—The American Cellulose and Chemical Manufacturing Company, Ltd., 108 Madison avenue, New York, N. Y., has concluded negotiations for purchase of a tract of about 1,200 acres of land in Giles County, near Pearisburg, fronting on the New River, as site for new mill for the manufacture of cellulose rayon products. It will comprise several one and multi-story units, with pumping station, filter plant, power house, machine shop and other mechanical departments. Initial plant will be equipped to provide for employment of about 1,500 persons, and is estimated to cost approximately $5,000,000, with machinery. Work is expected to begin at early date. Following completion of first plant units, other extensions will be made in the future to more than double the initial output, with ultimate investment to exceed $10,000,000.

Birmingham, Ala.—The Birmingham Paper Company, Fifth avenue South and Twenty-first street, manufacturer of commercial paper products, has awarded general contract to the Southern Construction Company, 611-15 South Eleventh street, Birmingham, for new addition to paper-converting plant, recently referred to in these columns. It will be three-story and basement and will be used for production of corrugated paper boxes and containers, school pads, envelopes and similar paper goods. New unit is reported to cost close to $175,000, including equipment. Work on superstructure will be placed under way at once. Charles H. McCauley, Jackson Building, Birmingham, is architect.

Front Royal, Va.—The Viscose Corporation of Virginia, Inc., Roanoke, Va., an interest of the American Viscose Corporation, 200 Madison avenue, New York, N. Y., manufacturer of viscose rayon products, has awarded general contract to Wark & Company, 1608 Chestnut street, Philadelphia, Pa., for new mill at Front Royal, where tract of about 263 acres of land was acquired a few months ago. New plant will comprise a group of one and multi-story units totaling about 350 x 2,000 feet in area, with pumping station, power house and other mechanical departments. It is estimated to cost in excess of $1,000,000, with machinery. Work will be placed un-

der way at once, with completion scheduled early in 1938.

Ambler, Pa.—The Keasbey & Mattison Company, manufacturer of asbestos mill board products, asbestos paper, etc., has plans in progress for new addition to mill, to provide for large increase in present capacity and facilities. It will be one-story, estimated to cost over $500,000, including equipment. United Engineers & Constructors, Inc., 1401 Arch street, Philadelphia, Pa., is architect and engineer. Work is reported to begin soon.

New York, N. Y.—The Bijou Container Corporation, recently organized, is said to be planning early operation of local plant for the manufacture of paper boxes and containers. New company is represented by Nathan J. Ginsberg, 16 Court street, Brooklyn, N. Y., attorney.

Clinton, Iowa—E. I. duPont deNemours & Co., Inc., duPont Building, Wilmington, Del., Cellophane Division, has taken an option on tract of about 200 acres of land at Clinton and is considering construction of a new cellophane mill at that place. Surveys are being made by company engineers to determine different features of project. Proposed mill will be of extensive proportions, comprising several one and multi-story units, with power house and other mechanical and operating departments. Estimates of cost are being prepared. It is said that early decision will be made regarding project.

Hamilton, Ont.—Perga Containers, Ltd., Main street West, manufacturer of paper boxes and containers, has completed plans for new one-story plant unit, to be 75 x 145 feet, estimated to cost close to $75,000, including equipment. General erection contract has been let to the Poag Construction Company, 9 Westinghouse avenue, and work on superstructure will be placed under way at once. Prack & Prack, 36 James street South, are architects.

Gatineau, Que.—The Canadian International Paper Company, Beaver Hall square, Montreal, Que., has plans nearing completion and will take bids soon for proposed new additions to mill at Gatineau, recently noted in these columns. Work will comprise a large one-story wing extension to present sulphite pulp mill, with installation of a battery of digesters and complete auxiliary equipment, clippers, conveying machinery and other equipment. Large increased production of unbleached sulphite pulp will be developed. It is expected to begin work on program this summer. J. C. Monty is company engineer at Gatineau, in charge.

Montreal, Que.—The St. Bastile Paper Company, Ltd., 19 Renfrew avenue, Westmount, K. A. Wilson, company head and representative, has plans under way for new one-story plant for manufacture of a line of paper specialties. It is estimated to cost close to $60,000, with equipment. Work is scheduled to be placed under way soon.

Flimby, England—The West Cumberland By-Products Company, Flimby, Maryport, has approved plans for new one-story addition to plant, to be equipped for the manufacture of carbon disulphide, used in the production of wrapping papers and other paper and cellulose rayon stocks. New mill unit will operate under a special process, recently perfected by the company, and is estimated to cost close to $75,000, with equipment.

Preston, England—The Ribble Paper Mills, Ltd., will begin operations soon in new local mill for the production of wrapping papers, using waste paper as source of raw material. Company has taken over a former cotton mill at Walton-le-Dale, and will develop plant for large capacity.

Kama, Russia—The Paper Industry Division, Soviet Russian Government, has begun expansion and improvements in newsprint mills of Kama Paper Mills, Kama, to include the installation of two large paper-making machines and complete auxiliary equipment. Each machine will have a rated capacity of 25,000 tons of newsprint per annum. The equipment was constructed at the Vtoraya Ryatiletka Works at Leningrad. Considerable other machinery will be installed in other mill departments. Entire project is reported to cost over $1,000,000.

New Companies

Los Angeles, Cal.—The Export Paper Corporation has been incorporated with capital of 250 shares of stock, no par value, to deal in paper products of various kinds. The incorporators include Walter J. Thomson, Monrovia, Cal., and Louis Steinberg, Pasadena, Cal. New company is represented by Michael A. Kliatt, 304 South Broadway, Los Angeles, attorney.

Detroit, Mich.—The Duffey Waste Paper Company has been organized with capital of $5,000, to deal in waste paper goods. New company is headed by John Duffey, 1571 Alger avenue, Detroit.

Johns-Manville Announces Two New Units

Lewis H. Brown, president of Johns-Manville Corporation, has announced that negotiations have been completed for the acquisition of two new properties by the Johns-Manville Products Corporation.

In Watson, suburb of Los Angeles, an option to purchase a 50-acre plot of land has been acquired; and as soon as possible construction will start on the first unit of a new million-dollar factory there.

This new plant will produce rock wool home insulation and Transite asbestos-cement pipe, two J-M products which are being widely used on the West Coast and which in the past have been produced by Johns-Manville only at its Mid-West and Eastern plants.

When completed early in 1938, the new plant is expected to employ approximately 300 men, Mr. Brown said. Initial plans call for the erection of two cupolas for the production of rock wool home insulation, and facilities for Transite pipe production will be installed as quickly as possible.

The second new plant for Johns-Manville was announced upon the completion recently of negotiations for the purchase of the Richmond, Ind. plant of the Fibre Conduit Company, which is consolidating its manufacturing activities at its Orangeburg, N. Y. factory. About July first Johns-Manville intends to begin the installation of equipment for the manufacture of a new type of low temperature insulation recently perfected in the J-M Research Laboratories, and which is covered by basic patents. Characteristics of the product include high insulating efficiency and lightness in weight which adapt it particularly for use on railroad, passenger and refrigerator cars, mechanical refrigerators, and for sound deadening as well as thermal insulation on automobile bodies.

When operations get under way it is expected that this new Richmond unit will employ about 150 people.

PAPER TRADE JOURNAL

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COMING EVENTS IN THE PAPER INDUSTRY

TECHNICAL ASSOCIATION OF THE PULP AND PAPER INDUSTRY—Fall Convention, DeSoto Hotel, Savannah, Ga., Oct. 18-20, 1937.

NEW ENGLAND SECTION, Technical Association of the Pulp and Paper Industry—Third Friday of each month at the Nonotuck Hotel, Holyoke, Mass.

DELAWARE VALLEY SECTION, Technical Association of the Pulp and Paper Industry—Fourth Friday of each month at the Engineers Club, Philadelphia, Pa.

LAKE STATES SECTION, Technical Association of the Pulp and Paper Industry—Second Tuesday of each month at the Conway Hotel, Appleton, Wis.

KALAMAZOO VALLEY SECTION, Technical Association of the Pulp and Paper Industry—First Thursday of each month at the Park-American Hotel, Kalamazoo, Mich.

PAPER AT ALL-TIME HIGH

Launched from the peak positions attained by some divisions in 1936, the paper industry encountered little interference to its progress during the first five months of 1937. No particular source contributed to the extension of the improvement for the fifth consecutive year, the spreading demand arising from the expansion of general business and the larger orders from regular customers. Even with the slackened rate of May buying, wholesale volume was 10 to 25 per cent more than in the 1936 five month period, while the gain in retail sales widened 15 to 30 per cent.

Scarcity of bleached sulphite, because of its greater diversion to the munitions, rayon, and other industries, prevented production from going more than 10 to 20 per cent ahead of the five months of 1936. From the total for the latter period, newsprint output rose 16.5 per cent to a new high at 11.6 per cent over the 1929 peak. For all grades, 1937 paper production has been estimated at 5 to 8 per cent over the record set in 1936 at 11.843,000 tons, as computed by the Writing and Cover Paper Manufacturers' Association, which surpassed the 1929 peak by 6.3 per cent.

Proposed and actual construction of mills, chiefly for the production of pulp, kraft, and newsprint, along the Atlantic and Gulf seaboard thus far this year ran in excess of $100,000,000. Wider price rises are expected this fall, when manufacturers start operations on pulp contracted above the current basis or on the still higher spot pulps. Labor costs have advanced, most estimates placing payrolls up 15 per cent from 1936 totals. These were some of the major developments revealed by a survey of the paper industry, which has just been completed by Dun & Bradstreet, Inc.

Handicapped by inadequate supplies of some types of pulp, many manufacturers were unable to reach the schedules planned for this year. Despite this situation, operations were advanced sufficiently to carry production from 10 to 20 per cent over that for the first five months of 1936. With shipments exceeding new business since mid-May, some of the mills turning out book and writing papers have been catching up on orders. Plants producing magazine, waxed, blottings, blanks, and cellophane still were behind on deliveries.

Rate of output for the five months of 1937, based on paper production reports to the American Paper and Pulp Association, reached a new peak at an average of 90.5 per cent of capacity. This was 14.8 per cent above the previous high of 78.8 for the 1936 period, and 31.2 per cent over 1935 at 69.0. Combined production of newsprint for Canada and the United States in May, according to the compilation of the News Print Service Bureau, rose to 388,235 tons, an increase of 13.0 per cent from the 343,742 tons in May, 1936.

No other month in the history of the industry exceeded this newsprint production total. It passed the former records of 383,686 tons in March, 1937, and 382,172 in October, 1936. The latter was the first to surmount the monthly peak held since October, 1929, at 373,923 tons. Total for the five months also set a new high mark, the 1,864,210 tons going 16.5 per cent over the 1,599,705 in 1936, and 11.66 per cent ahead of the 1929 peak of 1,670,797. It was 43.5 per cent more than the 1932 comparative of 1,299,336.

In spite of the new consumption records set down for some grades of paper in 1936, little relaxation in demand has been evident thus far in 1937. Each month wholesalers received more orders than in the corresponding one last year. While generous covering of future requirements early in the year resulted in less pressure in May, wholesale volume for the five months was from 10 to 25 per cent larger than for the comparative 1936 period. In the same comparison, the advance in retail sales ranged from 15 to 30 per cent.

Early in June, the unexpected broadening of orders in some wholesale markets indicated that the usual Summer recession probably would be skipped this year. Demand spread from bonds, ledgers, writings, sulphite, and other grades to bristols, glassine, tags, diploma, envelope, building, and roofing papers. The jump in magazine circulations and the launch-

ing of many new publications have kept the movement of books and covers at an accelerated rate.

Commitments for paper specialties and novelties, including cups, plates, towels, crepes, and similar lines set an eight-year high at some centers, as amusement parks and resorts made preparations for record patronage. Rising department store sales and multiplying industrial uses have maintained orders for wrapping and coarse papers at a peak all year, while the extension of paperboard consumption paralleled the gains in parcel shipments.

Wholesale prices have moved up on most lines since the first of the year, the range varying from 5 to 12 per cent. Sulphite grades have advanced steadily, and further rises are in prospect for kraft. To the mark-ups of manufacturers, wholesalers have been forced to add their own wage increases, higher taxes, and heavier distribution costs.

On April 1, some manufacturers advanced from $5 to $10 a ton contract prices on coated, bond, envelope, tablet, gumming, and many uncoated white papers. Effective July 1, an increase of $5 to $10 a ton has been scheduled on book and magazine (except contract), miscellaneous, converting, and waxing papers, due to the shortage of imported pulp.

Marking the third increase from the thirty-year low of $40 touched in 1933, the base price of newsprint for delivery during the first half of 1938 has been lifted to $50 a short ton from the $42.50 set for 1937. For the second half of 1938, the quotation is expected to reach $57, and in 1939 probably $65, the highest since 1928 at $66 a ton.

Paper Men's Sons Graduate From Yale

W. G. MacNaughton, engineer of the News Print Service Bureau, New York, last week attended the commencement exercises of Yale University, New Haven, Conn., and had the pleasure of witnessing his son, W. G. MacNaughton, Jr., graduate with the degree of B. A. Mr. MacNaughton, Jr., spent his sophomore year at the University of Georgia, at Athens, Ga., during the time that his father was stationed at Savannah, Georgia, as assistant director of the Pulp and Paper Laboratory of the Industrial Committee of Savannah, of which Dr. Hurty is the head. Mr. MacNaughton, Jr., will enter business.

Thomas Gerald Burke, elder son of Mr. and Mrs. Thos. J. Burke, received the degree of Bachelor of Science from Yale University Tuesday of last week.

Suspend Paper Rates Until Sept. 12

[FROM OUR REGULAR CORRESPONDENT]

WASHINGTON, D. C., June 28, 1937—The Interstate Commerce Commission has suspended until September 12 the operation of certain railroad schedules which propose to establish reduced rates on paper from York, Pa., and York Haven, Pa. to Richmond, Va.

As an example the Commission states that on a shipment of 18,000 pounds minimum the present rate from York to Richmond is 26 cents per pound while the proposed new rate would be 21 cents.

Production Monthly Summaries

The following statistics are based upon paper production reports to the American Paper and Pulp Association:

COMPARATIVE MONTHLY SUMMARIES

Months	1937	1936	1935	1934
January	90.3%(c)	76.1%	65.8%	.....
February	90.1%(c)	77.9%	70.0%	.....
March	90.3%(c)	76.0%	70.5%	.....
April	92.1%(c)	82.3%	70.0%	.....
May	90.6%(c)	81.6%	69.4%	.....
June	.....	80.7%	72.3%	.....
July	.....	77.3%	64.9%	.....
August	.....	81.5%	70.9%	.....
September	.....	80.5%	71.9%	58.2%
October	.....	87.6%	75.6%	64.7%
November	.....	88.0%	75.3%	61.7%
December	.....	85.9%	71.2%	59.6%
Year to Date				
First 24 weeks	90.2%(c)	79.0%	69.2%	.....

COMPARATIVE WEEKLY SUMMARIES

CURRENT WEEKS, 1937		CORRESPONDING WEEKS, 1936	
*June 5	85.2%	June 6	81.7%
*June 12	87.6%	June 13	81.1%
*June 19	87.4%	June 20	80.5%

The following statistics show the number of mills reporting by ratio groups:

	Number of Mills Reporting Current Weeks		
	June 5,	June 12,	June 19,
0% to 50%	56	50	35
51% to 100%	258	256	181
Total Mills Reporting	314	306	216

* Subject to revision until all reports are received.
(c) Basic capacity data have been adjusted to correspond with ratings reported on January 4, 1937 Machine Improvement Survey.

PAPERBOARD OPERATING RATIOS

According to reports from the National Paperboard Association, per cents of operation, based on "Inch-Hours", were as follows:

Mos.	1937	1936	1935	1934	Mos.	1937	1936	1935	1934
Jan.	80%(e)	61%	61%	....	July	....	69%	59%	....
Feb.	86%(e)	67%	67%	....	Aug.	....	75%	65%	....
Mar.	87%(e)	68%	67%	....	Sept.	....	76%	69%	62%
April	89%(e)	70%	61%	....	Oct.	....	82%	76%	63%
May	86%(e)	68%	61%	....	Nov.	....	79%	70%	56%
June	....	68%	65%	....	Dec.	....	74%	60%	52%

Week end. June 5, 1937—76%
Week end. June 12, 1937—82%
Week end. June 19, 1937—71%

(e) Basic figures revised to include new members of the National Paperboard Association.

Tomahawk Pulp Co. to Open Mill

[FROM OUR REGULAR CORRESPONDENT]

APPLETON, Wis., June 28, 1937—Steps were taken last week to reopen one of the very few remaining idle mills in Wisconsin, when the Tomahawk Pulp Company was organized to take over the ground wood mill of the Tomahawk Power and Pulp Company at Tomahawk, Wis. The mill is at King's dam on the Wisconsin River, and has not been in operation since June, 1935. It has been leased by the new company.

K. S. Dickinson of Appleton, Wis., is the president of the new firm, which will be managed by Carl Bronsted, who was general manager and purchasing agent of the Tomahawk Power and Pulp Company. The mill has six four-pocket International grinders and six 86-inch wet machines. Its capacity is 60,000 lbs.

Necessary repairs are being made, with the expectation that the mill will be started within two weeks. Twenty men will be employed at the start.

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Section of the
Technical Association of the Pulp and Paper Industry

Edited by Ronald G. Macdonald, Secretary

Improvements Incorporated in the Latest and Largest Fourdrinier Kraft Liner Board Machine*

By R. S. Johnston[1]

We are passing through a period of great changes, politically, socially, and industrially, which may be called evolutionary or revolutionary, as one prefers. Particularly is this true of the kraft section of the paper industry now in the throes of a tremendous development taking place in the South, which was brought about by the changed habits and practices of a nation, culminating in an ever increasing demand for cheap wrapping, bag, carton and container products.

Only a few years ago such products were manufactured on small slow speed machines. Today they are being made on the widest machines of the most modern design and construction attaining such manufacturing speeds as approximately 1250 feet per minute on bag and wrapping, 1000 feet on .009 liner and 650 feet on .016 liner. And this is only the beginning.

Such high manufacturing speeds are possible only on the Fourdrinier type of wet end which also permits forming a sheet of the required caliper and test but containing less material by weight. The object of this paper is to refer to the high speed type of Fourdrinier liner board machine such as installed in the new plant at Charleston, S. C., erected by the West Virginia Pulp and Paper Company, which is scheduled to start in operation commercially within the next few days. Despite the many new kraft pulp and paper plants recently installed and now in course of erection throughout the South, perhaps none has attracted as much attention as this unit.

The West Virginia Pulp and Paper Company needs no introduction to the American paper mill superintendent as they have long been recognized as preeminently outstanding among the older and larger units of the paper industry. With plants in New York, Pennsylvania, Maryland, Virginia and West Virginia specializing to a great extent in the better grades of book, lithographic, bond, ledger, writing, and a less extent in kraft envelopes, wrapping and liner; the announcement of an additional plant in the South for the manufacture of kraft liner came as no surprise to their friends in the industry.

The starting of this plant will be the fourth among the new plants in the South, following in sequence those at Savannah, Ga.; Crossett, Ark.; and Houston, Texas. When considering the fact that this plant is much larger than the ones referred to, with exception of Savannah, a remarkable record was achieved in completing the erection in slightly under 11 months from the time of breaking ground.

Largest Single Tonnage Machine

It was also not surprising that in selecting a machine unit the decision was in favor of the largest single tonnage machine as yet installed anywhere in the world for the manufacture of paper or board products. It is still today the largest regardless of the additional machines since ordered for other plants.

The initial production when manufacturing .016 liner is expected to average not less than 400 tons per day with a possibility of considerably increasing this tonnage later by the installation of additional drying capacity.

Briefly the general arrangement of the machine comprises Fourdrinier part suitable for wire 242 inches wide by 93 feet long, equipped with 40 inch diameter suction couch roll, 10 suction boxes, adjustable shake and quick-handling wire installation device; press part with two 38 inch diameter suction presses and a feltless third press (smoothing rolls); dry part consisting of four sections of 20 to 60 inch diameter driers in each section, making a total of 80 drying cylinders in all with provision in the building construction for the later installation of an additional section of 20 driers; two stacks of calenders, Pope reel, Cameron winder and an auxiliary four drum Moore & White winder for running off special shipping rolls. The machine sections will be driven by Westinghouse individual motors providing a speed range of 350 to 1400 feet per minute. Anti-friction bearings are used throughout the machine with exception of the calender stacks.

All the accepted modern mechanical improvements are incorporated in the construction as required to maintain continuous and uniform production at the highest manufacturing speeds, such as the use of anti-friction bearings, balancing of all running parts, automatic continuous lubrication, the motor driving of attachments formerly operated by hand, automatic paper handling devices, use of

* Presented at the annual meeting of the American Pulp and Paper Mill Superintendents Association, Springfield, Mass., June 23-25, 1937.
[1] Pusey and Jones Corp., Wilmington, Del.

bronze and stainless steel alloys as required for strength and corrosion resistance.

The Wet End

There are also a number of recently developed improvements incorporated in the machine as referred to hereafter in brief detail.

For handling the tremendous volume of stock the flow box is made of ample proportions of two-compartment design with additional intake compartment connected to the stock piping. Each main compartment equipped with an adjustable baffle and each partition with removable top sections to compensate for change in stock head. A streamlined effect is obtained by providing a semi-circular bottom in each compartment with the flow space between partitions and baffles progressively larger in size for the purpose of slowing down the stock and insuring uniform flow to the slice. A large perforated motor driven roll is provided in the flow space just ahead of the apron, serving as a current breaker and stock distributor. Construction consists of light steel plate stainless clad on the inside, supported on a rigid structural steel framework with interior wood partitions and baffles.

The slice is of combination type suitable for the versatile conditions when running on various grades of liner from .009 to .030 or heavier. It comprises the usual straight slice 60 inches high having adjustable lip located directly over the breast roll; a second adjustable lip slice 24 inches high immediately following, and a plain straight slice about 12 inches high following the second slice. In operation the first slice is used when making .009 liner, the first and second slices in combination on .016 and heavier weights, and the second and third slices in combination only on .030 and heavier. The slices all have vertical hand adjustment, the second and third having horizontal adjustment also. In addition the first slice is equipped with a motor operated mechanism for vertical adjustment of about 24 inches for conveniently and quickly handling from operating to non-operating position and vice versa.

The suction boxes are connected to a special mechanism giving a combination crosswise and lengthwise movement. This mechanism is motor driven and built into the Fourdrinier side frames. It is interesting to know that it is possible if desired to operate one or the other of the two movements independently by simply disconnecting several links.

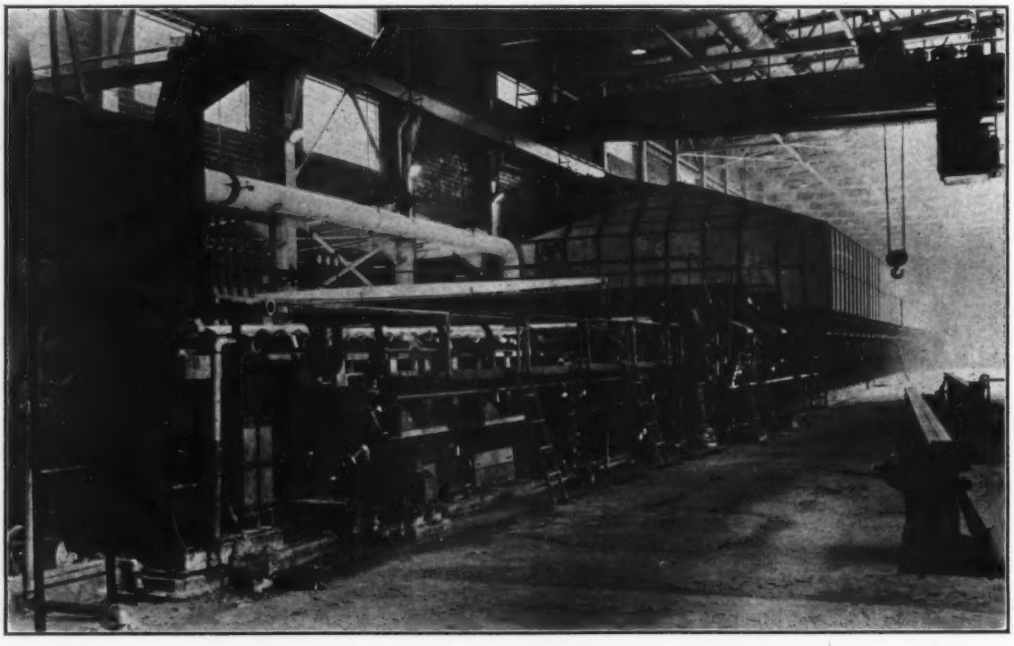
Throughout the construction of the wet end section every precaution was taken to protect all exposed parts against corrosion, at the same time insuring the necessary strength and rigidity combined with lightness in weight of all running and shaking parts, and with this in mind all heavy parts such as the main frames, removal beams, etc., are heavily sprayed with a coating of lead and practically all the light parts made of stainless steel or bronze. Even the holding bolts are made of stainless steel and fitted with special lock washers as insurance against possible damage to wires due to broken bolts or loose nuts.

Return wire rolls and press felt carrying rolls are made of light steel tubing covered with Monel metal by a special welding process resulting in a solid metal surface resistant to acid or alkaline white water, alum and corrosive stock, also particularly effective against the scoring action of doctors.

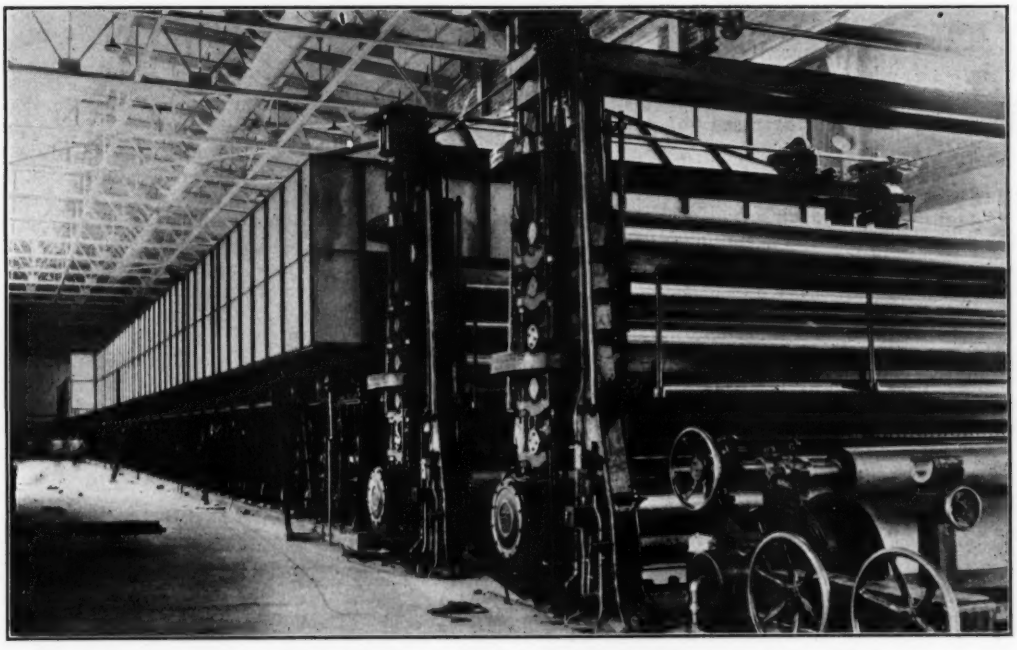
Practically all attachments on the Fourdrinier and press sections have been brought under remote control of the push button by direct motor driving such attachments as the main slice, flow box distributor roll, suction box oscillator, wire removable and draping mechanism, upper press roll lift, oscillating press doctor, bronze conveyors and the felt stretch of each press section.

The Drier Section

Many improvements have been made mechanically in the drier section. In the older liner board machines the operator had to contend with many mechanical ills attendant to drying of paper such as faulty syphons, leaky hand adjusted steam joints, inaccurate gears, unbalanced driers, hot running bearings and inadequate felt handling devices, resulting in costly maintenance, wasteful lubrication, bad draws, wet streaks, cockling, and consequent loss



View From Wet End of 242-inch Pusey & Jones Fourdrinier



VIEW FROM DRY END OF 242-INCH PUSEY & JONES FOURDRINIER

of production. The drier section today on the modern liner board machine is a marvel of mass balance and synchronism requiring the best in materials and the highest degree of workmanship in fabrication.

For instance the drier is made with a shell of special close grained cast iron alloy bored on the inside and fitted with semi-steel heads and high carbon steel journals. A compact and efficient arrangement is provided for the steam supply and condensate removal. The steam joint of oilless pressure sealing type is always in alignment, being supported by brackets from the outside of the gear enclosure with flexible tubing connecting the joint to the vertical steam and water piping, thus relieving it of any external distortion. The ingoing steam enters the drier as usual through the hollow journal and is controlled by a specially designed distributor nozzle attached to the inside of the drier head. The syphon pipe is amply supported by the steam joint on one end and by a special oilless bearing attached to the inside of the drier head. The syphon may be rotated and fixed in position by means of outside adjustment to meet operating conditions. This arrangement eliminates syphon troubles as the running clearance between the bottom of the syphon and the inside of the drier shell always remains the same. No adjustment of steam joint springs is required when a change in steam pressure is made and there are no lubricating troubles to contend with. All internal parts of the steam joint may be examined or replacements made without disconnecting the piping. There is minimum friction load from the running parts, this being proportional to the steam pressure carried.

Each drying cylinder weighs as much as 12 tons and as the machine is equipped with 80 driers in one geared 4-motor driven section the problem of supporting and rotating such a heavy load was one of considerable import. This has been taken care of by the use of anti-friction bearings securely applied on the journals by means of a taper fit. To compensate for the change occurring in the length of the drier due to expansion and contraction from temperature changes amounting by actual check from ¼ to ⅜ inch, a special mounting is used in which the front bearing housing is supported on three hardened steel rockers so arranged that it always remains at exactly the same height even when displaced in either direction. The housing is held against side movement by suitable guides in the base plate. With the bearing on the back journal mounted in a fixed housing neither the bearings or machine frames are subjected to thrust forces. This improvement pioneered in this county on the first unit at Savannah is now being used on practically all the large machines recently ordered for installation in the South.

Drier Drives

The enclosed gear drive on this machine has been greatly improved mechanically since it was first introduced. Briefly it comprises a small diameter gear mounted on the back journal extension of each drier; all the lower tier driers connected in continuous train horizontally by idler gears of the same size. Each lower idler connects vertically by a small intermediate idler to the gear on the upper drier. The gears are made of high tensile alloy accurately rough and finished cut with special stub teeth. The idler gears are each substantially mounted on two separate anti-friction bearings housed in the back frames. Such construction insures very easy acceleration in starting, steady draws and smooth operation up to the highest speeds. Lubrication is along very simple and economical lines. Instead of separately lubricating the gears and bearings or maintaining an oil level in the gear enclosure as previously done on some of the earlier installations, a common pressure system to the bearings and gears is now used, the overflow from the bearings being collected by channels cast on the inside of the gear enclosure and delivered directly to the gears. The oil draining to the bottom of the gear enclosures is returned directly into the oiling system after it is filtered and cooled.

A valuable improvement toward increasing the drying capacity has also been incorporated in this machine following the practice on several previous installations. Reference is made to the spacing between the driers. Until

recently the space between the upper and lower tier of driers was determined and limited by the size of the felt rolls, the doctor arrangement and the drier gears, principally the latter. The advent of the improved drier drive made it practical to depart from old conventions with the result that the spacing has been increased about 12 inches vertically.

The additional exposure of the sheet on both the up and down going passes between the upper and lower driers seems to assist in a quicker and more uniform dissipation of the vapor arising from the sheet, eliminating to a considerable extent the tendency for the vapor to become pocketed in the drier space.

The additional space also permits the better utilization of hot air in the case of the Grewin system or when using air distributor pipes extending full width of the machine.

To overcome a bouncing and pounding condition sometimes encountered when winding jumbo rolls of rough finish and uneven caliper on the Pope reel, an oil filled dash pot device is used. This is installed on each side of the reel connected at one end to the upper part of the arms supporting the roll core and the other end to the sill plates, effectively checking any tendency of the roll to bounce during the winding operation.

The reel is also fitted for the attachment of a special auxiliary motor drive unit for use when running on water finish liner when there is a tendency when starting a new roll for the roll core to slip in frictional contact on the main drum. To overcome this a variable speed motor is provided connected by a specially designed flexible shaft and coupling with the journal extension of the core. After placing the new core in the starting position in the reel the flexible shaft is connected by hand to the journal extension, the motor started, bringing the core up to paper speed prior to adjusting it in running contact with the main drum. The sheet is then broken down and started around the core in the usual manner. As the sheet builds up on the core and the core transfers to the finishing position, the flexible shaft automatically disconnects from the journal extension. The operation of this attachment is simple, eliminating considerable annoyance and resulting in less broken and perfect rolls.

All the features heretofore referred to assist in making this machine the most modern and efficient large tonnage unit yet installed anywhere in the world. As with all rapidly expanding industries, similar machines now under construction will be equipped with still additional improvements developed recently, of which a brief reference at this time should be of interest to the paper mill superintendents and engineers.

New Appliances

To assist in speeding up the installation of new wires on the Fourdrinier, a motor operated arrangement is provided for quickly handling the breast roll from the operating to the running out position and vice versa.

To obtain greater accuracy in adjusting and maintaining pressure on the main press rolls, a pneumatic loading system is now used comprising an air cylinder self-contained in each press housing and suitably connected to the swing arms carrying the upper press roll. Independent control is possible for each end of the roll. A two pin type recorder affords a continuous daily record of the loading and serves as a guide when adjusting by means of special regulating valves; recorder and regulating valves being mounted on a single panel conveniently located on the front side press housing. This may be connected to the available mill air supply. A necessary feature of the regulating valves is their ability to hold the pressure within extremely close limits regardless of any variation in supply pressure. In case of breaks the pressure can be unloaded instantly by manipulation of a valve. One very important advantage of controlled pneumatic loading over mechanical weighting by the old lever and weight system is the absence of inertia in the air cylinders permitting a roll that may be out of round to run smoothly without changing the pressure on the sheet every revolution. The life of the felt is increased, broke reduced, more effective drainage obtained and the quality of the sheet improved. The system is also used for lifting the upper roll eliminating all mechanical parts such as screws, gearing, ratchets, or hand wheels.

The automatic tightener for maintaining uniform tension on the drier felt by means of hanging weights attached to a tension roll has recently been improved by replacing the cumbersome weights with a special motor unit direct connected to the main operating shaft of the tightener. By adjusting a small regulating device operating in conjunction with limit switches the desired tension can be set and continuously maintained regardless of changes taking place in the length of the felt. The motor can also be used to slack up the tension roll when putting on new felts.

To overcome certain limitations and still further improve the operating and drying efficiency of the drier section a decided change was recently incorporated in the design and construction of the enclosed gear drive arrangement previously referred to. This consists of driving each upper tier drier by means of a small vertical double roller type chain from the adjacent lower idler gear shaft. The lower tier driers remain geared together horizontally as at present. The chain unit replaces each upper drier gear and its connecting idler. A small adjustable idler sprocket maintains the proper running tension on the slack side of the chain. Continuous lubrication is provided for each chain assembly direct at two points, assuring a copious supply of oil. This improvement provides a much more compact arrangement of framing with greater accessibility and improved ventilation and control of air circulation. It makes possible the use of longer draws between the upper and lower tier driers, resulting in better drying efficiency on high speed machines due to the longer interval for absorption of steam vaporizing from the sheet. Another feature of particular importance is a provision in the design of framing protecting the lower gear train from damage in the remote event of a chain breaking. Should this occur there would be no shutdown of the drier section as the upper drier would continue to run in contact with the felt.

One cannot help but be impressed by the tremendous forward strides in design and construction made during the past few years and incorporated in the new machines serving the kraft industry. With the recent ordering of the first newsprint machine for installation in the South it is freely predicted a similar development is under way which will eventually make the South dominant in newsprint production not only in the tonnage turned out, but also in the machine units capable of higher manufacturing speeds than those in use in any other locality.

Belgian Paper Mills Busy

Belgian paper mills were well employed at the end of the year with orders on hand largely covering the output of the mills. It was reported that foreign manufacturers who are amply supplied with orders have temporarily withdrawn from the Belgian market, or at least have considerably reduced their exports to this country. The mills report orders coming not only from the domestic consumers but from foreign countries, principally South America. The latter region is representing at the present time one of the principal outlets for the Belgian paper mills.

Evaluating the Printing Qualifications of Paper*

By M. S. Kantrowitz[1] and R. H. Simmons[2]

A recent advertisement states *(1)* "Clean paper in 1927 is dirty paper in 1937". A similar statement could be made about the quality of printing paper in general, for such have been the improvements in manufacturing processes, that printing paper in 1927 once regarded as good might not be regarded as good printing paper in 1937. Today it is the desire of the manufacturer of printing papers to know before shipment of his paper that it will print properly in the process for which it is intended. The printer desires to know before his paper goes to press that it will take the ink properly and possess the characteristics required to reproduce type matter and illustrations in a satisfactory manner.

The correlation of paper and ink in the printing process involves careful technical supervision and the closest possible cooperation of the paper and ink manufacturers and the printer-user, to obtain best results. So many factors involving so many variables enter into the process of printing that it is often difficult to attribute an ineffective appearance of the finished product to very specific causes. It is a matter of experience that ineffective printing, fre-, quently blamed upon the paper and the ink, may be entirely due to wrong technique in handling the mechanical phases of the printing process.

Laboratory tests for strength, opacity, sizing, thickness, gloss, smoothness, oil penetration and air permeability are directly related to the quality of the performance of paper in the printing processes. A very smooth finish, coated or supercalendered paper, is required to obtain closeness of contact with halftone plates in letter press printing to give best results in ink transfer, other qualities being equal. In contrast to this requirement for letter press printing, a great variety of paper stocks, including very rough surfaces, are adaptable to the offset process.

Research at the Government Printing Office has shown that a well sized sheet, with respect to water resistance, was not invariably resistant to all penetration. The degree of sizing does not always give an indication of the ink penetrability of paper. A careful study was therefore instituted by the Government Printing Office with a view to developing laboratory methods of paper testing for more definitely correlating these physical characteristics and the printing qualities of paper in order that its performance upon any particular job of printing might be reasonably predicted before the paper reached the press.

The first report was made by E. O. Reed *(2)* who in an article entitled "Ink Resistance of Printing Papers" described the oil flotation and the oil drop methods developed by the Government Printing Office for measuring the rate of absorption of printing inks by paper.

The Government Printing Office later employed these tests in connection with research studies of newsprint and news ink. The work was reported by Wehmhoff, Clark and Boyce in Government Printing Office Technical Bulletin No. 18. The results of this investigation showed a relationship between absorption, porosity and printing smoothness. As a given newsprint increases in smoothness it is in general less easily penetrated by oil, that is, less receptive to ink. As the smoothness of the sheet is increased, the density also increases with a resulting decrease in the porosity. Subsequent work by the Printing Properties Sub-Committee of the Technical Association of the Pulp and Paper Industry was reported by B. L. Wehmhoff *(3)* in a paper entitled "Evaluation of the Printing Quality of Paper" at the annual meeting of that Association in February, 1935. The principal tests forming the basis of this paper are density, oil penetration, oil absorption and printing smoothness. In this paper Wehmhoff reports that he was able by means of these tests on enamel and magazine paper of various degrees of smoothness to predict the printability of the paper. For example, after making these tests on one sample of paper and considering the process employed, the laboratory reported, "The roll will print without offset, strike-through will be noticeable and halftones will appear dirty and broken". Comparison of the actual print with the laboratory prediction proved the relationship between the laboratory tests and the printed results to be true in this as well as in other instances reported. He recommended that the Paper Testing Committee give serious consideration to the adoption of density, oil penetration, oil absorption and printing smoothness tests as tentative TAPPI standards.

The lack of reliable methods for measuring these properties of paper has been strongly felt by both paper manufacturers and printers. Technicians have recently developed scientific instruments for numerically measuring these physical properties of paper to forecast its working quality under printing operations. Chief among the road breakers in this comparatively new field of investigations is Dr. Julius Bekk, formerly of the Ullstein Press, Berlin, Germany, now with the G. H. Buhrmann Paper Company of Amsterdam, Holland. Dr. Bekk, in an article entitled "What the Printing Process Demands of Paper" *(4)* states, "The processes which take place in printing and upon which the quality and shortcomings of the paper exert an enormous influence are the following: (a) movement of the web or sheet of paper within the printing press; (b) ink transfer which takes place nearly always during the movement of the paper and which may be considered as the fundamental process of printing; (c) the drying of the ink and the various future interactions between paper and ink which take place in the finished printed matter". In this paper he discusses the most recent methods for measurement of important paper properties, such as smoothness, softness or elasticity, resistance to picking, power of absorption, strike-through and penetration, dusting, permeability and the detection of abrasive constituents in the paper surface.

In another article Dr. Bekk *(5)* discusses the important properties of papers and printing inks, difficulties encountered in the printing process, smoothness of papers, viscosity of printing ink and its absorptability and color strength.

* Presented at the annual convention of the American Pulp and Paper Mill Superintendents Association, Springfield, Mass., June 23-25, 1937. Prepared under the directionof Hon. Augustus E. Giegengack, Public Printer, U. S. Government Printing Office.

[1] Technical Director, U. S. Government Printing Office.

[2] Associate Chemist, U. S. Government Printing Office.

The Paper Specification Committee of the Congressional Joint Committee on Printing has given considerable thought to the printing qualities of paper. Since two of the principal tests forming a basis for reasonably forecasting the printing quality of paper are its oil penetration and its smoothness, requirements for these properties are included in the specifications of several of the book paper items of the Government Printing Office schedule, effective July 1, 1936. It was found necessary to include these requirements in order to obtain uniformity in deliveries from various contractors furnishing the same grade of paper. During a six months contract term four paper mills were manufacturing supercalendered book paper for the Government Printing Office on identical specifications. At that time no definite requirements for smoothness or oil absorption were included in the specifications. Two of these mills had a tendency to produce a smooth paper with a rapid oil absorption and the other two a paper with a somewhat lower smoothness and a slower rate of oil absorption. Both of these papers permitted reasonably good printing, but to obtain these good results it was necessary to vary the ink and press conditions for each paper. Since specifying definite smoothness and oil absorption properties, this difficulty has been largely eliminated.

Smoothness

Printing is the process of transferring ink from forms to the surface of paper. The closer the contact of the inked form with the paper surface, the more perfect the transfer. Therefore, the covering power or specific coverage of an ink on a given paper is influenced not only by its absorptability but also by the smoothness of the paper surface. A rough printing surface will require more ink than a smooth one to attain a definite degree of coloring or ink intensity. Smoothness therefore may be regarded as an index of the facility of a paper to make the most intimate contact with a smooth inked surface while under the influence of pressure. It is therefore readily comprehended that for purposes of printing, smoothness is one of the most important properties of paper. Smoothness pertains to the mechanical perfection of the paper surface rather than to any optical characteristic. In this respect it differs from gloss which is determined by measuring the quantity of light reflected from the paper surface.

The first practical instrument used by the Government Printing Office for measuring the smoothness of paper surfaces was a combined smoothness and porosity tester invented by Dr. Julius Bekk. The Government Printing Office purchased the first one of these instruments sold in the United States. With this instrument the smoothness of paper is determined by measuring the time in seconds required for 10 cubic centimeters of air to be drawn by a vacuum of 0.5 atmosphere between the surface of the paper and a circular polished glass plate having an area of ten square centimeters. During the test the sample of paper is covered by a soft rubber pad and is subjected to a total pressure of ten kilograms or one kilogram per square centimeter. A description of this instrument is given in a technical article, prepared by the Division of Tests and Technical Control of the Government Printing Office, entitled "The Bekk Smoothness Tester as an Aid in Studying the Printing Quality of Paper". *(6)* Following is the detailed method for measuring the smoothness of paper by means of the Bekk tester. *(7)*

Proposed TAPPI Standard for Bekk Test of Relative Printing Smoothness of Paper

This method consists of rating the smoothness of a sheet numerically by measuring the time required for the passage of a definite volume of air between one surface of the paper and a polished glass ring of definite area under controlled atmospheric conditions.

APPARATUS.

The testing instrument shall consist of (1) a circular optically flat surface having a small circular aperture in the center, (2) a soft smooth rubber pad for sealing upper surface of test specimen, (3) a means of applying a direct known pressure to the test area, (4) a means of passing a known volume of air between the paper surface and the plane surface and (5) a means of measuring the volume and rate at which the air passes between the two surfaces. The vacuum type instrument shall be used.

The condition under which tests shall be made are an effective area of 10 sq. cm., a pressure on this area of one kilogram per sq. cm., and a vacuum of 380 mm., measuring the time for the change in vacuum to 360 mm. The air chamber shall be of such a size that this fall in vacuum will be caused by the passage of 10 cc. of air between the two surfaces under the controlled conditions.

All samples must be conditioned under the TAPPI standard conditions and all tests must be made under these standard conditions.

TEST SPECIMEN.

The specimen shall be so selected from the sample secured by the official sampling method as to be representative of the sample. Any convenient size specimen may be used, preferably a two-inch square.

Place a specimen on the 10 sq. cm. plane surface. Cover the specimen with a soft smooth rubber pad (see note) and apply the pressure of one kilogram per sq. cm. Reduce the air pressure in the vacuum chamber until the manometer registers 380 mm. of vacuum. The time necessary for the vacuum as indicated by the manometer, to decrease from 380 to 360 mm. is taken with a stop watch. This figure represents the time necessary for 10 cc. of air to pass between the plane surface and the surface of the test specimen. This is a numerical measure of the smoothness of the specimen.

Note: Rubber pad 2 x 2 inches—3/32 to ⅛ inch thick. When not in use the rubber pad should be kept on a glass frame over tetrachloride in a closed container. This keeps the rubber in a soft, pliable condition.

It is advisable to clean the surface of the pad frequently with carbon tetrachloride to insure freedom from grease, oil or dirt which might be accumulated in use.

REPORT.

The report shall give the minimum, maximum and average of 10 tests to the nearest five seconds, an equal number to be made on each side of the sheet.

This method and methods for determining oil penetration and oil absorption were recently written and submitted by the authors to the Paper Testing Committee of the Technical Association of the Pulp and Paper Industry to be considered for adoption by that Committee as tentative standards.

Our experience with the Bekk tester over a period of six years has demonstrated to our satisfaction that the results obtained by this instrument can be definitely correlated with the printing quality of paper. We have found this to be especially true in the case of book, lithographic and chart papers. The conditions of operation of the Bekk tester are comparable to the conditions which exist on a printing press at the time of printing.

There are other instruments for measuring the smoothness of paper such as the Gurley Smoothness Tester and the Williams Smoothness Tester. It should be noted that

the numerical values obtained by these three testers are not identical.

The Gurley tester *(8)* was developed in the research laboratory of the International Paper Company. In making smoothness determinations with this instrument, the sample of paper is held between two highly polished circular metal blocks under a pressure of 0.5 pound per square inch. Air is admitted to each side of the paper through annular slits, about one millimeter wide, in the metal surfaces. Each of these slits is connected to a hollow cylinder bearing a piston actuated by gravity and scaled with mercury. An average pressure of approximately 0.4 pound per square inch, equivalent to 12 inches of water or 22.4 mm. of mercury, is developed by the falling pistons. The smoothness number is the time in seconds required for 5 cubic centimeters of air under the given pressure to pass between the paper surface and the test block. The smoothness of both sides of the paper is simultaneously determined.

The Williams Smoothness *(9)* and Radial Porosity Tester employs a variant method by measuring the time in seconds required for a definite amount of air at a definite pressure to be forced outward between the two surfaces of the paper sample folded upon itself. The sample is perforated in the center and clamped between rubber faced plates, which seal the two outside surfaces of the folded sample against the escape of air.

These three instruments employ the same basic principle, measuring the rate of air flow between two surfaces. The Williams Tester, however, differs from the Bekk and Gurley instruments, in that the air flow takes place between two paper surfaces pressed against each other and not between the paper surface and a hard, polished surface as is the case of the two latter instruments.

Oil Penetration

The penetration of printing inks into paper is dependent primarily upon the vehicle used in the manufacture of the ink. It may be considered as a process of infiltration. Some of the ink vehicle penetrates the paper, but the pigments themselves tend to remain on the surface of the paper, except for a small portion which may be forced by the printing pressure into the open paper structure. A test for such penetration is informative in that it furnishes an indication of the ink receptivity of the paper.

For determining the oil penetration of paper the Government Printing Office uses the "Oil Drop Method". The instrument, as well as the method for determining this property of paper, was developed by the Division of Tests and Technical Control of the Government Printing Office.

Castor oil is used as the standard liquid medium in this test, since the use of printing ink itself for measuring penetrability would involve great difficulty in securing a perfect standard ink for the purpose. The great variation in printing ink compositions required to suit various kinds of paper and the wide variety of commercial printing ink formulas offered for the same class of printing would make test results obtained by the use of a single standard ink incomparable. The instability of printing ink is another deterrent factor in its use for this purpose because of the possibility of a change occurring in the working character of an ink after manufacture due to chemical and physical reactions between its various components. Another objection to its use lies in the difficulty of accurately measuring test quantities and of securing a satisfactory end point for complete penetration. On the other hand, castor oil, which has a viscosity similar to ordinary ink vehicles, may be obtained in standard U.S.P. quality and does not change with aging.

Other methods have been devised for determining oil penetration. Grantham and Ure *(10)* describe an apparatus and method in which they use castor oil, cod liver oil and an ink oil as liquid media. They state that the results of these tests were in every respect analogous to those obtained by the castor oil flotation method.

Hammond *(11)* describes the use of a photo-electric cell for this purpose. With this tester either castor oil or oil inks are used as the penetrating liquid and the operation of the instrument is based upon the change in light reflectance from the opposite surface of the sheet as the medium penetrates it. The end point is recorded by a galvanometer activated by a photo-electric cell.

Oil Absorption

Initial absorption may be regarded as the first factor in the setting of printing ink onto the surface fabric of the paper in such a manner that the freshly printed form shall not be disturbed or smeared by any succeeding process such as feeding, backing up, or folding.

Wehmhoff *(3)* found that the oil drop method for measuring the penetration of printing inks is not suitable for such papers as poster board or coated stocks, since misleading results may be obtained from variable absorption of the oil by the different substances composing the paper, such as a non-absorbent coating combined with a very absorbent body stock, or a very absorbent coating combined with a non-absorbent body stock. He therefore developed a method for measuring the surface absorption of oil and this method has also been found applicable for testing heavy papers such as index and chart papers.

Dr. Julius Bekk (12) has devised an apparatus for studying the absorptive capacity of paper for various printing inks. A weighed strip of the paper under examination is printed upon with an excess of ink by means of a solid plate having a definite area of 100 square centimeters and thereafter the surplus of ink is completely removed from the test strip by blotting with smooth paper. The increase in weight of the test strip corresponds to the quantity of ink absorbed by the paper.

Grantham and Ure *(10)* determine the oil absorption of newsprint by means of an oil drop absorption method, which is similar to their oil penetration method except that the time is recorded for the disappearance of a drop of oil into one surface of the paper instead of measuring the time for the complete penetration of the oil drop through the sheet.

The following is the method used by the Government Printing Office for measuring the oil permeation of paper. This method includes test procedures for oil penetration and oil absorption determinations.

Suggested TAPPI Standard for Measuring Oil Permeation of Paper

Oil permeation of paper may be measured either as the time necessary for the oil to penetrate from one side of the sheet to the other, or, as the time necessary for a measured amount of oil to be absorbed by the sheet. The first method is suitable for easily peremable papers, such as book and mimeograph papers; the second method is suitable for heavy printing or coated papers, where absorption of the ink or oil is chiefly of a surface nature. These papers, because of thickness or non-uniformity of the construction of the sheet, as in coated papers or board, do not give satisfactory results when tested for rate of oil penetration.

OIL PENETRATION OF PAPER.

Apparatus (1) Box: A box approximately 9 inches long, 7 inches wide and 8 inches high. The front is open and the top is ground glass. The glass has a ¾-inch hole at its

center. A ground glass partition is set parallel with the front of the box.

The sample is illuminated by a 25-watt light placed behind the glass partition. This allows the light to pass through, but prevents excess heat from affecting the results of the test.

An adjustable mirror in the bottom of the box allows the operator to observe the bottom of the sheet.

(2) Dropper: A means of dropping oil on the paper is supported over the sample with the point at 2 inches above the top of the box. The dropper (a 100 cubic centimeter separatory funnel is suggested) is drawn to such a diameter that 25 drops of distilled water at 70 degrees Centigrade delivered by the dropper will occupy a volume of one cubic centimeter plus or minus 0.05 cubic centimeter.

(3) A stop watch.

Test Specimen. The specimen shall be so selected from the sample secured by the official sampling method as to be representative of the sample. Any convenient size specimen may be used, preferably a 2-inch square.

All samples must be conditioned under the TAPPI standard conditions and all tests must be made under these standard conditions.

Procedure. Place a specimen on the ground glass cover of the box centered directly over the hole. Allow a drop of castor oil (U.S.P. grade) Sp. Gr. 0.958-0.970 at 15.5° Centigrade (60° Fahrenheit) to fall on the paper. Start the stop watch as the oil strikes the paper. Observe both sides of the test specimen for complete penetration of the oil through the paper and measure the time interval from the instant of contact of the oil with the paper until the oil spot assumes a uniform translucency. The time for complete absorption of the drop is not considered. The oil drop may be covered with a black box if desired, in order to give a greater contrast to the drop as penetration proceeds.

The report shall give the maximum, minimum and average time to the nearest five seconds of ten tests on each, the wire and felt, side.

OIL ABSORPTION OF PAPER.

..Apparatus (1) A means of dropping oil on the surface of the test specimen is supported over the sample with the point at 2 inches above the paper. The dropper (a 100 cubic centimeter separatory funnel is suggested) is drawn to such a diameter that 25 drops of distilled water at 70 degrees Centigrade delivered by the dropper will occupy a volume of one cubic centimeter plus or minus 0.05 cubic centimeter.

(2) A roller 3 inches long, 1 inch in diameter, coated with ½ inch of Ideal Roller Composition [a]. This roller is used to spread the oil on the paper to be tested.

(3) A weight or other means of applying a constant roller pressure of 2 pounds when spreading the oil.

(4) A stop watch.

Test Specimen. The specimen shall be so selected from the sample secured by the official sampling method as to be representative of the sample. Any convenient size specimen may be used, preferably 8 x 10 inches.

All samples shall be conditioned under the TAPPI standard conditions and tests made under these standard conditions.

Procedure. Allow a drop of boiled linseed oil, having a Stormer viscosity of 5.0-6.0 seconds at 25 degrees Centigrade, to fall from the dropper on the test specimen.

Spread a film of oil on the specimen by making a quick pass of the roller from back to front of the specimen. This is done as the drop strikes the paper and the stop watch is started while the roller is passing over the specimen. Measure the time until the disappearance of the sheen on the film of oil on the high spots of the test specimen.

Report. The report shall give the maximum, minimum and average time to the nearest five seconds of ten tests on each, the wire and felt, side.

(a) The roller may be purchased from the Ideal Roller Manufacturing Company, 22nd street and 39th avenue, Long Island City, N. Y.

OTHER PAPER CHARACTERISTICS RELATED TO PRINTING QUALITY

Let us here review briefly some of the salient characteristics of paper and their significance in relationship to printing quality.

Weight. This term is self explanatory and is the basic factor in controlling other characteristics such as thickness, bulk, smoothness and porosity.

Thickness. Uniform thickness is essential for good printing. Variation in the thickness of paper results in variations in blackness or color intensity, and impairs the printing quality of the sheet. It is readily comprehensible that if the press make-ready is prepared for a certain thickness of paper, a thinner sheet in passing through the press will not receive the same degree of impression and will not, therefore, receive the full tonal value of the ink. On the other hand if the press make-ready is for a thin paper, any paper of greater thickness will receive a heavier impression, forcing the type into the sheet and producing an embossed effect on its reverse side. This heavier impression may also cause the appearance of strike-through by forcing the ink deeper into the paper.

Formation. A closed and uniform formation in the paper structure is desirable for the production of good printing. A wild or open formation is attended by thick and thin, as well as hard and soft, spots. No amount of make-ready can overcome the obstacles presented to printing by paper having a wild formation. Under such conditions the ink will be unevenly distributed resulting in mottled or spotty printing.

Porosity. The porosity of a paper is a factor in the quality of printing. For example, in the offset process, it controls to some extent the spreading of the ink under the pressure of the rubber blanket. Dr. Bekk states *(15)*, "In illustration printing by the offset process the porosity of the upper surface is of particular importance. More ink will adhere to the rubber blanket than to the smooth metal plate of the letter-press printing form; and thus, after an impression is taken, a quantity of ink will still cling to the rubber blanket. The amount thus adhering will depend upon the porosity of the upper surface of the paper. In order to attain a desired degree of blackness the process demands the presence of a reserve supply of ink on the blanket, the amount depending on the porosity of the paper. The larger this excess of ink is and the less porous the paper, the more tendency there is for the ink to spread or smear. Unlike letter-press printing where this spread causes the formation of black "pressure rings" (seen in the black margin outlining the type or print) the rubber blanket offers no such avenue of escape and the extremely viscous rich ink spreads over the paper. Thus a high degree of porosity is the only method for adjusting defects in tone value and contour reproduction.

There are several instruments designed for measuring the porosity of paper, among which may be mentioned the Gurley Densometer, the Schopper Densometer and the Emanueli Porosimeter. The Bekk tester, for measuring the smoothness of paper may also be utilized for determining its porosity.

Opacity. A high degree of opacity is essential in print-

ing papers. Deficiency in the opacity of paper is chiefly responsible for printed matter showing through from the reverse side of the sheet. Technically, opacity is expressed in terms of either contrast ratio or transmitted light. In the measurement of contrast ratio the paper is backed successively by a white block of magnesium carbonate and by a black body. The intensity of light reflected from the surface of the paper, under these conditions of total reflection by the white body and partial absorption by the black body backing the paper, is interpreted into numerical terms by various devices in different instruments. The reading obtained with the black body divided by the reading obtained with the white body gives a decimal known as the contrast ratio. Opacity is also expressed in terms of transmitted light by measuring the amount of light which passes through the sheet of paper from a standard light source. Opacity expressed in terms of contrast ratio is not identical with opacity expressed in terms of transmitted light.

Compressibility. This property of paper is defined as the reciprocal of the bulk modulus, being the ratio of the pressure applied to the change in volume produced. The compressibility of a paper is expressed as the differential in its thickness when calipered under low or zero pressure and when calipered under higher pressures.

In letter press printing it is essential for good printing that the paper be smooth to obtain a uniform contact between the paper surface and the inked printing plate. Due to their structure and composition some papers are more compressible than others, therefore a sheet capable of being easily compacted under the printing pressure may print as well as a somewhat smoother but less compressible sheet.

Picking. Paper is said to pick when the inked form, while printing, causes fibers, or even small portions of the paper itself, to separate from the body of the sheet. Coated paper picks due to the fact that the adhesive power of the ink is greater than the adhesive power of the coating for the paper, or because there is not sufficient bonding strength in the base stock to prevent its splitting. This picking of the surface coating is not always due to a weakness of the coating material, but may also be caused by the use of an excessively tacky ink. If such is the case, in order to correct the condition, the tackiness of the ink must be reduced, since the physical interaction between the ink and the paper coating depends upon their relative cohesive powers.

Fluffing or dusting. These terms may be applied to a condition of paper when loose or pulverulent materials are separated from the paper by friction or pulled away by the action of the printing ink. This fiber or dust rises in the air over the press settling on the rollers or printing plates and interfering with good printing. Fluffing or dusting may also seriously contaminate the ink being carried on the rollers back into the ink fountains.

Dr. Bekk *(4)* describes instruments which he has designed to measure these conditions of compressibility, picking or fluffing for predetermining the paper's behavior in the printing press under operating conditions.

Paper Difficulties Experienced in Relation to Printing Quality

We have previously discussed the causes of these and other printers' difficulties in an address *(14)* made before the annual meeting of the American Pulp and Paper Mill Superintendents Association at Richmond, Virginia, in June, 1935. In this paper we stated that certain unpredictable difficulties arise under operating conditions and have their origin either in variations of the atmospheric conditions in the pressroom or in certain properties inherent in the paper itself. Among the troubles arising from changes in atmospheric conditions are expansion and contraction, curl, wrinkling, wavy edges, cracking of coated paper, and static electricity. Troubles arising from inherent conditions of the paper include web breaks, two-sided papers, variation in thickness, variation in color, deficiency in opacity, fluffing, picking of coating, unsatisfactory ruling quality, objectionable odor, and unsatisfactory general appearance.

Niemczyk *(13)* states, "The principal and most frequent complaints in printing are known as strike-through, show-throught, offset, surface picking and uneven printing.

"The term strike-through is used to denote the staining of the reverse side of a printed sheet by the ink vehicle penetrating through the paper. This, of course, affects the quality of printing on the opposite side of the sheet.

"The term show-through denotes the appearance of printed matter on the reverse side or back of the paper. Show-through is, in a greater part, directly related to the transparency of paper, whereas strike-through tends to accentuate this condition.

"Offset is one of the most serious troubles encountered in printing. The term is used to denote the transfer of ink from a printed sheet onto the back side of the following sheet, if it is folded, as in the case of forms printed on rotary presses. Offest can also occur between the first and second impression cylinders of a rotary press.

"Picking is the breaking or picking of the surface of paper by inks used in printing on it. This condition is usually prevalent in papers with insufficient or improper sizing or calendering.

"Uneven printing has reference to the mottled or spotty appearing printed matter, and is primarily due to poor formation."

The Proof Press as a Means of Evaluation

Prior *(16)* describes the use of a hand driven press for determining the essential factors of printing, namely, the surface to be printed from (type surface), the proper ink film, the surface to be printed upon (usually paper) and the desirable pressure. He found the press to give uniform results which have enabled the pressure and ink volume to be measured and controlled so that different papers can be compared for their relative printing merits. This press was found very useful for predicting the relative behavior of different papers on a commercial press with regard to evenness and depth of printing, strike-through and set off.

Ink Receptivity

The amount of ink necessary to attain a particular degree of color intensity in printing is related to both the paper and the ink. We can not speak of the absolute absorptability of a particular paper, but rather of the absorptability of that paper in connection with particular kinds of ink; nor can we speak of the penetrability of a given printing ink, but rather of the penetrability of that ink with respect to a particular paper.

The amount of ink used to obtain intensity of color should be limited to the absolute minimum that will give the desired result. Therefore the quality of the ink used is of great importance, but the composition of the surface of the paper also exerts an important influence. In general, the smoother and less porous the paper the less ink will be required. The nature and distribution of the paper filler also exert influences upon the printing quality of the ink. A paper possessing high smoothness and low porosity but a large percentage of filler, may need more ink than a porous paper having a rough surface but a low percentage of filler. The influence of fillers as an absorptive constituent of paper is also evidenced by the fact

that the wire side of most kinds of paper apparently requires less ink than the felt side, although the felt side is visibly smoother and less porous. Owing to these involved relations it is not possible to set hard and fast rules, by reference to the chemical and physical characteristics of the paper on the one hand and the printing ink on the other, for the amount of ink required on either printing surface of the paper.

Diefenbach in a recent article *(17)* brought out the fact that the ink must be designed not only for the process, but for the press, the stock and the use for which the printing is intended. He states that if the sheet is open the ink will appear flat. The amount of penetration, however, can be regulated in practice to a large extent by the mutual adjustment of the paper and ink. Most papers receive ink partly by adhesion and partly by absorption, therefore, the amount of press impression must be changed according to the type of papers employed. Porous papers should receive more impression than smooth and relatively non-absorbent sheets.

In every class of paper the physical characteristics are subject to many variations. The variations in smoothness, penetration, absorption, porosity, formation, thickness, opacity, amount of ink required and other variables result in variations in the quality of the finished product.

The paramount requirement for paper is therefore uniformity of physical characteristics. Even with the best of materials and attendant operating conditions, close co-operation between the paper maker, ink maker, and printer is most essential for obtaining the highest quality of effective printing.

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Progressive Forces in the Paper Industry*

By George R. Wallace[1]

When the committee came to me and suggested that I speak on the subject, "Progressive Forces in the Paper Industry" I considered that it was a pretty large order. It would be a large order for even a paper mill superintendent, though I have never known one in my twenty-seven years in business who would not jump at the chance to expound on any subject dealing with paper. The subject had me against the ropes, but because I consider a suggestion from your committee as a command performance for me I am ready to tackle it.

This paper business is a grand business and today I like it, but you know one's attitude toward it is not the same every day in the year. Last year our company had struggled through seventy-five years and at a meeting of our board some of the directors, who are not active in the management of the business, got quite excited about the anniversary. They thought we should make a lot of bally-hoo about it with advertising, brochures, etc. to tell the world about those seventy-five years. Finally, one of them asked if I had any thoughts of putting over their idea in a big way. I couldn't help but think of the headaches I had experienced during the previous five years in trying to keep the old company afloat and I told them I only had one idea and that was that we should get out some new stationery and at the bottom of each sheet we should have printed: "We Have Been in Business for 75 Years—And We Are Damn Good and Sick of It." That idea didn't go over so well—it broke up the meeting and I all but lost my job.

The Unhappy Years 1931 to 1936

Those unhappy years from 1931 to 1936 gave us all a swift kick in the pants and made us all go to work. Prices were on the toboggan as you well remember. We weren't in the paper business—we were in the price cutting business—and that business was wonderful. We were going to the dogs at a dizzy rate, even to the point that if we didn't pay any salaries or wages we would still lose plenty of money. What a fine state of affairs for so-called business men to get into. Some of the strongest companies believed, however, they could survive and because they thought there were too many paper mills anyway it would be a mighty good thing if some companies went over the dam. As prices and production went lower and losses went to appalling limits the financially strong mills realized we were all going over the dam together. That was not so good, so at that stage of the game we began to get some sense; the executives did what you did some ten years ago. We formed an association and after a few meetings we got to know that our competitors were really human beings after all and we could talk with them without an intense desire to commit murder or mayhem. From that time the industry began to go forward. Associations of executives, sales, TAPPI and this association of yours are tremendously strong, progressive forces in our industry. They bring men with a common interest together to exchange ideas and help make the industry work on the principle that made the Three Musketeers such a formidable unit—"One for all and all for one." We can all remember when we would not let an outsider in the plant and I am glad those days are gone too. We have found that a closed door

* Presented at the annual convention of the American Pulp and Paper Mill Superintendents Association, Springfield, Mass., June 23-25, 1937.
[1] President, Fitchburg Paper Company.

keeps out more than it keeps in and we are all benefiting by the general practice of the interchange of ideas and the present open door policy is a result of you fellows getting together in this association. Nothing should be allowed to interfere with an association that is such a powerful force of progress in our industry.

Great Believer in Technical Trend

I am a great believer in the technical trend. I believe it is going to do a whole lot of good for our industry. It has already done so, but I also know that to be effective it must be seasoned with the salt and pepper of actual paper making experience. And it is absolutely necessary for mutual appreciation and understanding to exist between the departments of production and technology. If there was ever a case where these groups should pull together it is the case right here and now in the paper industry. Those who do are going to go ahead awfully fast. Those who don't will find themselves right behind the eight ball.

Close Laboratory Control

The demand for close laboratory control has resulted in a higher and more uniform product and companies with technical staffs have benefited by lower costs of operation. I wish we had had a technical staff years ago to help us out of one situation of dirty paper in our plant. I was chasing tail ends on the paper machine at the time, but I heard plenty of that incident. One of our customers seemed to periodically write letters severely criticizing the management for the excessive amount of specks in the paper. You all know what these kind of letters sound like. Because this was an old customer and we were on reasonably friendly terms, our manager wrote one of those letters that attempts to explain the trouble. Having already run out of all other excuses he laid the cause of the specks to the fact that due to warm spring weather flies had gotten into the mill and fly specks was the result, but that he would get some fly screens for the windows and he was sure there would be no further cause for complaint. The manager received a prompt reply to that, which read: "Dear Sirs: We are in receipt of your letter letting us know that you are putting screens on the windows of your mill to keep the flies out. After further examining the shipment referred to and noting the size of the spots in the paper it is our recommendation that instead of putting screens on the windows to keep the flies out, you had better put bars in front of the doors to keep the cows out."

Influence of Technical Men

In the last ten years our industry has been forced forward by the contributions made by the technical men, chemists and chemical engineers. When we first had our technical staff I was a little confused with the definition of chemists and chemical engineers. I asked our director of research what was the big difference anyway between a chemist and a chemical engineer and his reply was that you take a chemist and put a monkey wrench in his hand and you have a chemical engineer. I found out that on occasions, due perhaps to their enthusiasm they throw that monkey wrench. But in the long run they have done an excellent job for us.

Developments of Modern Machinery

Another force of progress for our industry is the development of more modern machinery by technologists and by the machinery manufacturers. We still have a long way to go in finding better and cheaper methods of making paper. The paper industry is one of the oldest, but it has a future which was undreamed of not many years ago and what we have most need to invoke is plenty of imagination. It is rather a sad commentary on the paper industry when we consider the tremendous progress made in the automobile and aeroplane industries over the past thirty years. In the last hundred years we have only modified Fourdrinier's original method of making a continuous web and one of these days some bright guy is going to completely revolutionize our present methods. Until that time arrives we must keep our plants modernized and up to the minute. You simply cannot compete unless you do and too tight a purse string on capital investments, insofar as modern machinery is concerned, means eventual shutting down and washing up for the last time. As a matter of fact, you won't even need to wash up.

Paper Industry Changing Rapidly

I do not need to outline to you the new uses, new grades of paper and relatively new grades of pulp. But our industry is changing rapidly and changing by the influence of so many forces of progress it is difficult to keep up with the procession. Just consider the development of the slash pine in the South and the advantages which are offered by this enormous supply of relatively cheap, fast growing pine. It is bound to accelerate material and therefore production and is going to make it possible to save thirty-five years in the growing of pulp fibers. Perhaps you have thought of the implication. How this one development alone is going to increase the use of paper in ways neither the public nor most of us ever imagined. And each new use and each white rabbit that the research boys pull out of the hat will represent a new task for the mill superintendents.

I like my subject and I like this audience and could go on, but I've got to get back to the plant to see if any of our customers have cancelled any orders and you have, I presume, some plain and fancy golf playing to attend to. But I just want to say in closing that I am sure the progressive mill executives recognize the powerful force of progress that the National Association of Paper Mill Superintendents represents and when your meetings are adjourned and you go back to your plants keep in mind that we are entering into an era of a greater demand for paper of all grades than ever before experienced in the history of our industry and with the forces of progress that are always present put all of your imagination plus your experience to the challenge it presents.

Swedish Pulp Journal Issues Annual

The annual issue of the *Swedish Timber and Woodpulp Journal* has just appeared with 212 pages. It contains a great many interesting articles in both the Swedish and English languages. The annual numbers of the Journal are intended to give a survey of the preceding year from commercial and technical points of view and thus to have the character of a Year Book, reviewing productions, export and markets for the various products of the Northern timber, pulp and paper industries. The numbers contain extensive statistical material in this connection.

In the issue of 1937 the technical development in the pulp and paper industries of the Scandinavian countries is dealt with in a very complete form in both Swedish and English. Technical questions and news are also dealt with in a number of special articles. Of a more general nature are a description of the Iggesund Company's new sawmill at Hudiksvall and a discussion of the chartering question from industrial point of view.

The annual issue can be ordered from the A.-B. Svensk Trävaru-Tidning, Kungsgatan 17, Stockholm. The price is 3s. 6d., postage included.

Value of Automatic Temperature Control In The Production of Groundwood Pulp*

By C. D. DeMers[1]

The paper mill superintendent's responsibility starts in the pulp mill; and while every phase of production between the pulp mill and the finishing and shipping rooms is important, it is obvious that the production of the pulp is of the greatest importance if the paper ultimately made on the machine is to measure up to the high standards so necessary in this day of aggressive and keen competition.

The importance of a stock uniform in the characteristics best suited to the product made in each plant has been responsible for a steady improvement in the design of wood pulp grinders, types of stones, size and speed of driving unit, pocket pressures, compensating pressure governors, and grinding temperatures, until today the ground wood process is standardized to an extent that would have seemed impossible even twenty years ago.

One of the greatest changes in the shortest period of time has been in the temperature at which ground wood pulp is produced. Up to and until about nine years ago, grinding temperatures very seldom exceeded 145 degs. F., and in many plants was from 15 to 30 degs. below that point.

During the past nine years grinding temperatures have been steadily increased, until now 155 to 170 degs. are quite standard, and in many plants temperatures of 190 degs. or more are maintained.

A most significant fact in connection with this marked increase in grinding temperatures is that the first satisfactory installation of an automatic temperature control on a wood pulp grinder was made in 1930, and the question of what part automatic control played in this increase in grinding temperature with a resultant increase in production at a lower power consumption is one that we of the instrument industry feel should be given careful consideration in your study of past and future improvements in the grinding of wood pulp.

In our study of the process some years ago, carefully checked records were made of temperature variations under hand and automatic control, and we found that it was practically impossible to maintain grinding temperatures within 10 to 30 degs. of any predetermined point under hand control of the shower supply to the stone.

This study was made with a highly sensitive recorder bulb located at a point in the grinder where it was constantly covered with stock from the entire width of the stone and with normal operating conditions existing in the stone pit.

It is not our intention to suggest to you any rules or formulas for improving your technique in the production of ground wood pulp. With a background of long experience, you know a great deal more about the process than we do. It is our object, however, to call to your attention the very noticeable and consistent effect of variations in grinding temperatures on some of the major variables, the possibilities of closely controlling grinding temperatures by hand, the results obtained with automatic temperature control, and to leave entirely the value of the application to your judgment.

As a result of a comprehensive and complete test made at a well known Canadian ground wood plant during 1936, a plant, by the way, where the very highest standards of grinding practice are maintained under the supervision of two most competent ground wood operators, we were able to compile some authentic and interesting facts pertaining to the effect on production and other major variables when grinding under hand and automatic control of the showers.

This test, lasting fourteen days, was made under the following conditions:

A line of three pocket type grinders driven by a 1200 horsepower, 250 rpm motor, each grinder equipped with a Taylor Fulscope type grinder temperature control unit.

A recording watt connected to the 1200 horse power motor was used in recording the power consumption each 24 hours and was carefully checked at all times by the test crew.

Each grinder equipped with a natural stone of good quality.

A pressure of 65 lbs. per square inch was maintained on the hydraulic cylinders.

The wood used was spruce 24 inches long, of fairly constant hardness throughout, and was carefully racked and measured during the entire test.

Tests of 24-hour duration were run at different temperatures from 125 degs. to 175 degs. F., and were evenly divided between hand and automatic control of the supply line to the showers.

Stone pit samples were taken at regular intervals for standard freeness tests, and careful record made of each burring operation.

Now, let's consider the results as affecting several major variables—temperature, production, power consumption, freeness, and stone cost.

* Presented at the annual convention of the American Pulp and Paper Mill Superintendents Association, Springfield, Mass., June 23-25, 1937.

[1] Taylor Instrument Companies, Pulp and Paper Division.

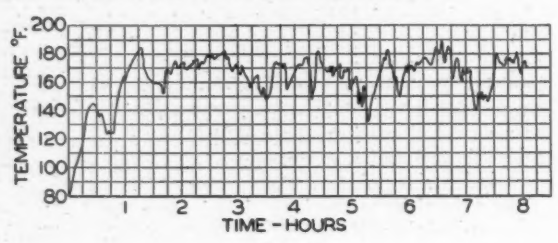

FIG. 1

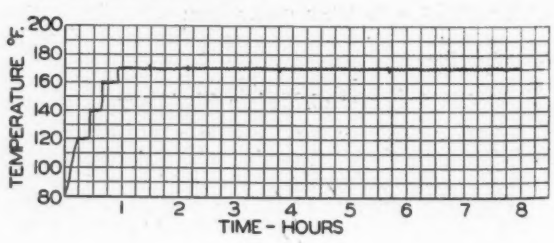

FIG. 2

In the case of temperature, the following graphs (1) and (2) represent the the average variations in the grinding temperature maintained by hand and automatic control throughout the entire test. Note the wide fluctuations from the 160 deg. point the operators were attempting to maintain during the period of hand control, and the very slight variations in temperature during the period of automatic control.

What is the significance of these two graphs? Let's consider production, as maximum production at the lowest power consumption per ton consistent with the quality of the stock required is the main objective of every ground wood plant superintendent, and the following graph No. 3 showing how consistently production increases and power consumption decreases with rising temperatures will clearly demonstrate the importance of maintaining a uniform temperature at the highest point consistent with the character of the stock being produced.

A clear and striking example of the effect on production when controlling the temperature by hand in a plant where operating standards are exceptionally high and where the operators have the benefit of a temperature recorder as an aid to close control as compared with production under automatic control is shown on the following graph Fig. 4.

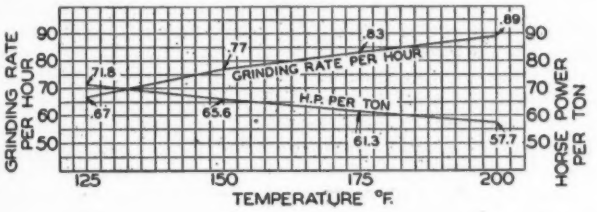

FIG. 3

Note the increase of 2.25 per cent in production under automatic control. Any increase in production is important when it can be accomplished without sacrificing quality.

Now, how about power? The following graph Fig. 7 brings out very clearly the actual power consumption per ton of ground wood pulp produced under both hand and automatic control, and we call to your attention the 6 per cent decrease in power consumption under automatic temperature control.

Ground wood pulp—yes, and power too—whether hydraulic direct or through generators and motors, has a definite marketable value, and each one present must admit that an increase in production at a saving of over 6 per cent in power is worthwhile regardless of the size and operating conditions at any groundwood plant.

The question has been asked regarding the effect of

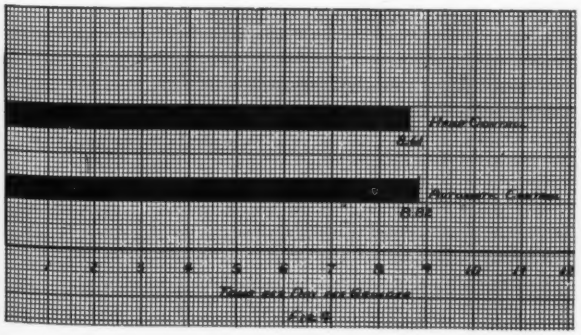

FIG. 4

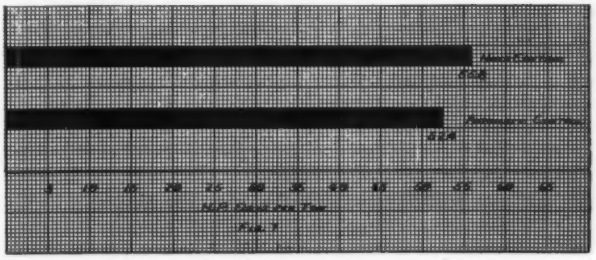

FIG. 7

automatic temperature control on stock freeness. We must admit that freeness is affected by variables other than temperature and that uniform temperatures will not entirely eliminate variations in freeness, but as freeness increases directly with temperature and is a function of temperature, other conditions being constant, it is obvious that uniform grinding temperatures are conducive to a more uniform freeness.

During the test under consideration it was shown as indicated on graph Fig. 9 that variations in freeness from a given mean were over 66 per cent less during the period of automatic control.

The grinder stone companies will tell you, and you know by actual experience that wide and sudden fluctuations in grinding temperatures are a serious strain on grinder stones, both natural and composition types, and cause practically all of the spalling, cracking, and even more serious accidents of stone explosions.

Stone cost per ton, insofar as this test is concerned, refers only to natural stones. As the test was of only 14 days' duration, no figures were available on actual expenditures for stones, but as the burring action obviously reduces the diameter of the stone to some extent, and as

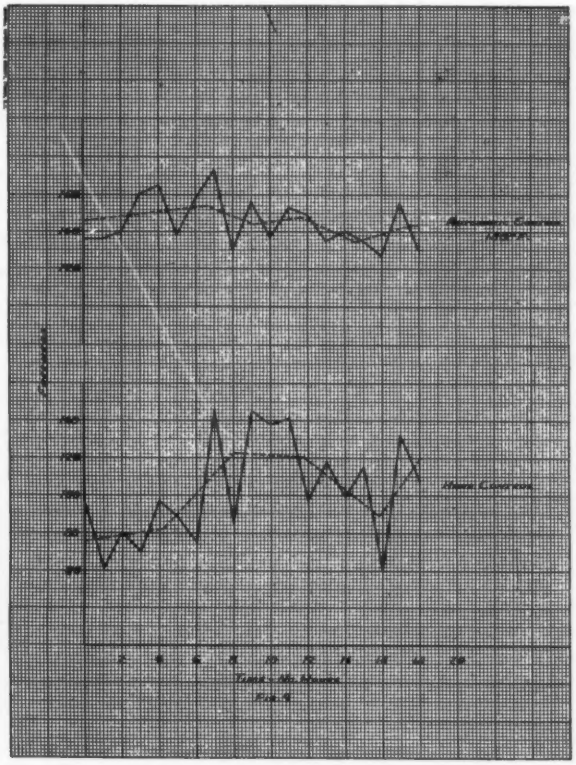

FIG. 9

it was shown, during a period of ten days (five under hand control and five under automatic control) that the number of burring operations was reduced over 17 per cent during the automatic control period, it is safe to assume that a definite saving in stone cost was shown.

A resume of the test shows:

1. That with automatic temperature control grinding temperatures were maintained within 2 to 4 degrees of any definite predetermined point.
2. A material increase in production.
3. A definite decrease in power consumption per ton of stock produced.
4. A more uniform freeness in the stock produced.
5. Indications of a lower stone cost due to a longer period between burring operations and the elimination of damage to stones caused by wide fluctuations in temperature under hand control.

You may ask what type and size of grinder is most benefited by temperature control. Well, we developed the application on a Waterous hydraulic magazine type grinder. The success of the first installation resulted in equipping 38 additional grinders of the same type for the same company.

A prominent member of your Association has told you of the advantages of temperature control in the operation of the Great Northern type grinder. The results obtained encouraged the superintendent of another plant operating Great Northern type grinders to standardize on Taylor equipment.

An installation of the Taylor control system on two continuous or caterpillar type grinders has resulted in a total of 26 controls in the same plant and on the same type grinders.

The test under consideration was made on standard 3-pocket type grinders.

The application is important in the operation of all types and sizes—the smaller pocket type as an aid to the increase in production necessary to justify their operation in competition with more modern equipment, and the larger capacity as an aid to the high efficiency necessary to justify the large investment involved.

The degree of value depends entirely on the operating standards and practice in each plant. We feel that each superintendent is the only one to answer that question, but we also feel that an addition to your equipment that will increase the efficiency of a major production unit with a resultant reduction in conversion cost will justify your serious consideration of its use in your plant.

Automatic temperature control on a wood pulp grinder is not a cure-all of the many problems a part of so complex a process, but if properly installed and intelligently used and cared for will justify its cost, relieve the operator of a duty entirely beyond his ability to carry out, and at the same time allowing him more time for the many other duties he is better qualified to do.

The task of sensing the variations in temperatures and correcting the heating or cooling medium to a point within close limits cannot be accomplished except by the use of precision type instruments properly developed for each application.

We offer for your consideration the Taylor pulp grinder temperature control unit especially designed for and developed under actual plant operating conditions as an important, practical, and reliable addition to your plant equipment.

The Evolution of Sized Paper Drying*

By Frank W. Partsch[1]

We might just spend a few moments in looking back and reviewing the system used in this important phase of the bond and ledger field, in fact, in the drying of all fine papers, and some not quite so fine.

The original system, and one which is by no means totally out of favor, is to size at the end of the paper machine, and slit, cut and lay in stacks, thus of course, getting a wet packing. The stacks are then taken to the pole loft, where the sheets are hung in spurs, and according to the weight, there may be as few as four or as many as twenty-five sheets per spur. These spurs are hung over loft poles and allowed to dry, in some cases overnight and in others as long as four days. Temperature is controlled by hand valves and as high as 180 deg. F. has been used in a pole loft.

These lofts had no air systems, the only circulation being that created by steam coils on the side walls and a small ventilator in the ceiling.

The method of hanging four to twenty-five sheets, one over the other in the spur, naturally caused a great variation in the drying; every sheet differing from that over or under it. The outside sheet would of course dry faster and the edges were too easily over-dried.

Forces Circulation System

The first forward step was the introduction of a forced circulating system, in which a fan and heaters were employed to distribute the air, and there is no doubt that such a system did reduce the drying time as well as tending to give more uniformity in the sheet although the operation and maintenance cost is, of course, an item for consideration.

In order to avoid variances in drying, air washers were added and temperature and humidity control was incorporated in the forced circulation system to retard the fast drying, and this considerably evened up conditions.

Originally when the paper was removed from the pole loft it had a definite pole back but this could hardly be prevented when a sheet was dried in a fixed position. The humidity control reduced the harshness of drying and made the back very much less troublesome.

Fast presses were not then universally used, so the back did not present the problem that it does today.

Web Drier

The next forward step was drying in the web, and here we have the spar or slat drier, which consisted of wooden skeleton wheels arranged much the same as the ordinary double decked driers.

Drying in the web on moving drums or rolls did away with any chance of back or pole mark as the paper traveled progressively through the drier, not being contacted at any one point continually. Once again steam coils furnished practically all the circulation, this time on the floor under the machine; but soon paddle wheel fans were arranged inside the skeleton wheels and driven

*Presented at the annual meeting of the American Pulp & Paper Mill Superintendents' Association, Springfield, Mass., June 23-25, 1937.

[1] Manager, Eastern Div., J. O. Ross Engineering Corp., New York City.

through the trunions. These fans generally rotated in a direction opposite to that of the Spar wheel itself, and at much higher surface speeds; the fans sometimes having at times the speed of the driers.

The steam coil system of drying was later replaced with forced circulation, consisting of fan, heaters and duct work and nozzles to cause the air to impinge on the sheet as it was in contact with the Spar driers.

The Barbour Drier

Then came the first Barbour drier, which was made up of a series of rolls 6″ to 8″ in diameter spaced horizontally 12″ to 18″ on centres and vertically 3 feet to 6 feet on centres. This proved to be a much faster drier, required less floor space than the Spar drier and apparently was an improvement.

The system of air distribution on these first Barbours consisted of large disc type fans on each end of a main header; from this main were branches leading to circulating ducts under the bottom rolls and over the tops rolls. These ducts were cross slotted and the air was blown into the pockets formed by the paper; in these ducts were steam coils which were operated manually.

The chief trouble encountered was the matter of tension, which was difficult to control over the entire length of the drier. To overcome this the drier was constructed in sections and tension was regulated by cone pulley drives.

Though the tension could be manually controlled it was not as uniform as desired so the festoon system of drying was brought into play. This was not a new system of drying, having been used in connection with coated papers for half a century or more, it was however new for sized papers. With this type of system the paper was allowed to dry naturally. There was practically no tension, in fact the only tension in the sheet was that caused by its own weight as it hung between moving sticks.

Like the old pole loft drier sheet, the festoon dried sheet presented the formation of a back, really a decided stick mark, and this time opposite to the grain of the sheet.

Higher speed presses were now coming into their own, and it was necessary in some way to overcome this stick mark. Turners were provided so that the paper, in contact with the stick, was moved to a new location. While this did, to a great extent, lessen the stick mark it also caused a new trouble, as wrinkles would form on account of the stick being turned while the sheet was shrinking. To further decrease the stick mark it was found necessary to install what was termed a preliminary drier ahead of the festoon, and this worked out very well indeed at the time.

It might be mentioned here that these festoons, in most cases were enclosed and the air system consisted of a fan, heaters, air washer and temperature and humidity controller.

Before it was realized that we had not gone far enough with the preliminary drying, the festoon system found its way to disapproval on account of the stick mark, which seemed inherent, and in spite of the fact that the color and pop test had been greatly improved.

However, various different arrangements of festoons, with preliminary driers, preheaters ahead of the preliminary drier, conditioning systems after the festoons, even straight pass driers, have been, and still are being, used in this field. There are some festoon lines which will hang 6300 feet of paper and take over one hour to dry; there are short festoon lines that will hang only 600 feet of paper and will dry in six minutes or less. It is natural to assume that the same grades of paper could not be produced on these two vastly different machines; each of them has its own particular adaptability.

Tension Controlled Barbour Loft

Several years ago, after much experimenting, the tension controlled Barbour left was offered to the trade and installations of this type have been made, varying in length from one holding 300 feet of paper to one holding 800 feet of paper, and with speeds varying from 75 feet per minute to 250 feet per minute. This arrangement has eliminated the objections of the earlier installations and gives excellent control for both tension and air circulation.

The air system we now use has an independent unit for each section, and each unit has controlled temperature. Fresh air is introduced, through filters, to the dry end section, return air is drawn from this section by the next unit and delivered to its section, and so on through the entire length of the drier. At the wet end is an exhaust fan which discharges the moist air to the atmosphere, or if desired, this air may be distributed to the finishing room or other parts of the manufacturing space where humidity is required.

As each sectional system has a controller unit which allows considerable range in temperature, we are able to vary the conditions to suit all grades of paper, from a wood pulp sheet to a 100 per cent rag sheet and reasonably control the cockle. Variations, of course, can also be made for different grades of size and different percentages of soak.

The manufacturer has his own ideas on wet packing, and though our experience has been that the sheet tests better after being wet packed, we have many installations where the paper is put through the size tub immediately before entering the drier.

With the enclosed drier good steam efficiency is obtained and it is very easy to maintain the desired conditions at each section.

The festoon system of drying sized papers is still very much alive; the modernized arrangement, and one that eliminates all stick marks, is to install a tension controlled Barbour loft ahead of, and in series with it. Several units have been so rearranged and entirely new driers have combined the two types of system where longer drying time or drying at lower temperature is desired.

Another installation made within the past few years is a Spar drier job, totally enclosed, with forced air circulation and controlled temperature. We hardly believe that this type drier would be of interest to the manufacturers of light weight papers but for heavier papers the performance is very satisfactory.

While going through this general forward movement we have made innumerable tests in our laboratory and have dried sized papers at temperatures as high as 450 deg. F. on starch size. We have, however, come to the conclusion, and to this the papermakers generally agree, that temperature should be kept considerably lower, and on some grades of paper as low as 100 deg. F. Humidity control may very soon become more generally accepted as an aid to better drying of sized papers of certain grades.

Argentine Imports More Newsprint

[FROM OUR REGULAR CORRESPONDENT]

WASHINGTON, D. C., June 28, 1937—Arrivals of newsprint paper in Argentina were larger during April than in the preceding month or the corresponding month last year, according to a report from Trade Commissioner A. Cyril Crilley at Buenos Aires. There was not much change in exports of chemical pulp which have been averaging about 2,000 bales monthly. Arrivals of mechanical pulp totaled over 18,000 bales during April, which was more than twice the number of March arrivals, but about on the level of April, 1936.

Some Factors in Soda Losses in Alkaline Pulping*

By G. A. Day[1]

One of the most important points in the economy of a soda or sulphate mill, is the question of the soda balance through the system. Some mills will claim salt cake usages as low as 175 pounds of salt cake per ton, while others will admit usages of over 400 pounds, but it is common experience to all, that in spite of very careful measurements of all known losses, it is not possible to account for the known consumption of soda. This discrepancy between input and output may reach as high as 50 per cent, and is frequently attributed to furnace loss, as losses from the recovery furnaces are known to be high, and are difficult to determine with a satisfactory degree of accuracy.

Stating losses in terms of salt cake per ton of pulp is a good index of cost of chemical per ton, but it may be misleading when considered as an index of efficient operation. A mill which is making a raw kraft, using the minimum of soda, and cooking for a short time to a high percentage yield, will employ much less soda per ton of pulp than other mills which are aiming at a well-cooked pulp. Accordingly, a fifteen per cent loss in the cycle of a bag stock mill might give a lower figure per ton than a ten per cent loss in another mill whose liquor cycle is really more efficient. For convenience, I shall retain the usual form of pounds of salt cake lost per ton of pulp produced.

In surveying the losses from any alkaline pulp mill, it is obvious that the sources of loss fall naturally into two groups.

1. *Unnecessary Losses.*
   1. Loss during blow.
   2. Evaporator loss.
   3. Leaks and overflows.
2. *Necessary Losses.*
   1. Pulp washing.
   2. Sludge washing.
   3. Lime reburning.
   4. Furnace losses.
   5. Cleaning tanks, evaporators, etc.

The first group should obviously not be permitted to occur, and so requires little discussion. Proper sewer measurements, with continuous sampling and an alert operating crew who are "liquor conscious", will go far toward eliminating this type of loss. Each mill should determine the cost of evaporation and the value of soda, taking into consideration the fuel value of the black liquor, in plants where by-product steam is obtained from the recovery system. By balancing the cost of evaporation against the value of the soda content, the strength of black liquor can be determined, below which it should be run to waste, and above which it should be recovered. White liquor of any strength should naturally be reclaimed, as long as the mill capacity for handling weak white liquor is not exceeded.

The more interesting part of the loss question is in the study of those points where some loss must necessarily occur, with a view to keeping them to a minimum, and also decreasing the discrepancy in the usual soda balance, referred to above. There are one or two points in connection with each of these losses, which I shall discuss briefly.

1. Pulp Washing

Soda lost per ton of pulp washed, is usually estimated by determining the percentage of dry stock in a washed sample, and testing the liquid present in the stock for its content of soda, by some rapid method, such as a hydrometer or a conductivity test. Knowing the proportion of liquid in the stock, and the strength of the liquid in soda content, the amount of chemical lost per ton can be readily calculated.

Although widely used, this method always gives a result which is too low. The stock as it comes from the digester contains considerable quantities of soda absorbed on the fiber which does not appear from tests done on the liquid. This property of cellulose of adsorbing or fixing alkali is, of course, very well known, and has been studied to a considerable extent, but I do not recall that attention has been directed to its significance in pulp washing. We find that the quantity of soda present in this form depends on a considerable number of factors, such as cooking conditions, strength of liquor, method of washing, etc., so it is not possible to give you more than an approximate idea of the magnitude of this quantity.

Fig. 1 shows the result of one series of tests, but I should like to emphasize that nearly all our tests have given results about 50 per cent higher than this particular series, so that loss from this source can only be determined by tests at the mill interested, and values taken from this curve are very conservative.

Fig. 2 is calculated from the data given in Fig. 1, and it is apparent that the more complete the degree of washing, the more important the adsorbed soda becomes. Statements as to washing losses nearly always neglect this factor, and in consequence are about twenty pounds per ton lower than the truth. Another result of this action of adsorption is to increase the alkalinity of the white water, which is particularly noticeable in mills which have a tight water system. Careful soda determinations on white

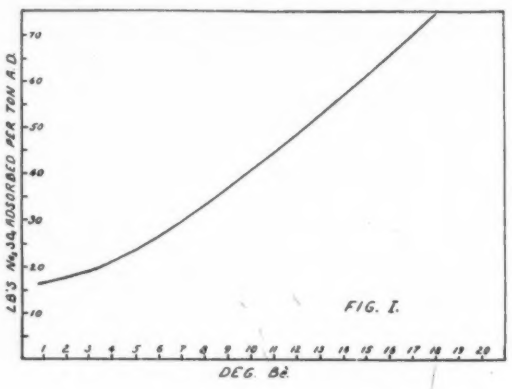

FIG. 1.

* Presented at the annual convention of the American Pulp and Paper Mill Superintendents Association, Springfield, Mass., June 23-25, 1937.

[1] Chief Chemist, Brown Corp., La Tuque, Ind.

water as discharged to waste, will generally show an appreciably higher soda loss than would be anticipated from stock washing losses, even when allowance is made for adsorbed soda.

2. Sludge Washing

The second necessary loss in a mill, is that caused by sludge washing, and would appear to be a definite quantity which can be readily evaluated. Investigation shows, however, that in this case also there is a soda loss that is not apparent.

When liquor is causticized with lime, appreciable quantities of insoluble soda are formed in the sludge, which no amount of washing will remove. This soda appears to be in the form of a double carbonate of sodium and calcium, $Na_2Ca\ (CO_3)_2$. This double carbonate occurs naturally, and its termed gaylussacite when carrying five molecules of water, and pirssonite when it has only two molecules. The quantity of insoluble soda formed in the sludge is controlled chiefly by the strength of the liquor causticized, although the use of slaked lime for causticizing has a definite tendency to increase the quantity. The concentration of sodium sulphate has no effect, so apparently there is no formation of any double sulphate.

The presence of sodium sulphide may contribute to the sludge loss of insoluble soda in a different manner, as it causes the formation of the familiar green dregs which various investigators report to be a sodium iron sulphide $Na_2S.Fe_2S_3$.

As in the case of soda adsorbed on the pulp, actual data as to the quantity of soda lost in this manner has to be determined in the plant, as the quantity will vary according to causticizing practice, as to strength of liquor, quantity of lime, use of quick or slaked lime, etc. As an indication of what may be expected, we have found that samples prepared from pure chemicals, and causticized in the laboratory, will give contents of insoluble soda calculated as sodium sulphate of from 1.4 per cent to 2.3 per cent on the weight of the dry sludge, depending on the factors already mentioned. Samples of mill sludge show about 1.8 per cent of insoluble soda expressed as salt cake.

The loss per ton of pulp will depend on the amount of lime used in the mill. A mill using lime at the rate of 400 pounds per ton, would discharge nearly 700 pounds of dry sludge per ton, corresponding to a loss of about 13 pounds of salt cake per ton in an insoluble form. This loss is fairly small but may be considerably higher. The only mill that I have known to evaluate this loss, other than ourselves, gave thirty pounds of salt cake per ton, as their loss due the formation of insoluble soda in sludge.

3. Lime Re-Burning

As our mill does not re-burn lime sludge, we have not investigated the influence of using re-burned lime on the amount of insoluble soda formed. It seems reasonable to expect that the concentration of this material will increase, with each cycle of use. Moreover, a portion of the combined soda volatilizes on calcining. A sample of dry, washed, sludge containing the equivalent of 1.88 per cent sodium sulphate by weight, contained only 1.42 per cent equivalent sodium sulphate based on the weight of the original sludge after calcining. Kiln burning under plant conditions, with the charge swept by a current of gas would increase this loss.

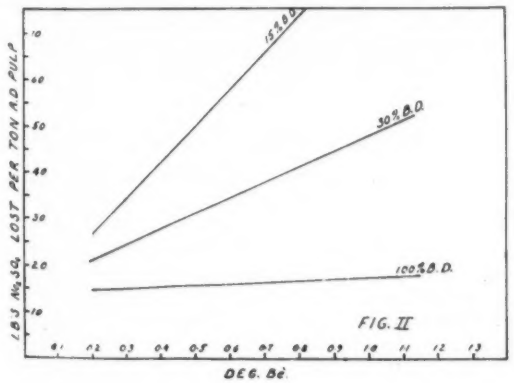

FIG. II

It would be very interesting if some of the mills now re-burning their sludge would give us some information as to kiln losses, by determining the ratio of CaO to Na_2O in and out of the kiln, so that the order of magnitude of soda loss in calcining could be determined.

4. Furnace Losses

We now come to the consideration of the most serious source of loss in the mill economy, stack loss from the recovery system.

Spray types of recovery furnaces are frequently blamed for seriously increasing the amount of furnace loss. This loss seems to be pictured as a mechanical one, due to the entrainment and carrying over of particles of sprayed liquor, and the formation of a lighter and more porous char which gives particles more easily entrained.

That the bulk of stack loss is not due to physical entrainment can be shown very readily by analysis of the ash carried out of the furnace by the gas stream. A representative sample of the black ash carried out of a spray-fired kraft smelter will analyze about as follows, although considerable variations can be caused by furnace operation.

Insoluble matter	1.0 Per Cent
Sodium carbonate	2.5 Per Cent
Sodium sulphite	0.8 Per Cent
Sodium sulphate 94.0	Per Cent

It is immediately evident that the proportion of carbonate to sulphur compounds is entirely different from the ratio existing in ashed black liquor or in the smelt stream. It would therfore appear that the greater proportion of this material cannot be produced by mechanical entrainment, but must be the result of a process of sublimation or volatilization.

In order to obtain data on the factors controlling this tendency to volatilize, we are now making a study in the laboratory of this action under controlled conditions. Very little information appears to be available, in the literature, as to the factors controlling reduction of sodium sulphate to sodium sulphide, and nothing of any value that I was able to trace, on sublimation of the various compounds that are formed in black liquor smelting.

So far, our laboratory work has been only with pure compounds, although we propose carrying out more complete studies, utilizing dried solids from black liquor of varying composition.

Some of our results are shown in the table. Sodium sulphate was found to be very stable in dry air, or in air mixed with superheated steam up to temperatures of 1900 deg. F., and these results are not shown. As sodium sulphide is not a satisfactory material to handle, experiments on the volatility of this material were made by using sodium sulphate as the initial substance, and exposing it to the action of a stream of hydrogen. Since the sulphate itself was known to be quite stable, losses were attributed to the sodium sulphide which is rapidly formed under these conditions.

Although the table given above is only an outline, it is sufficient to suggest some interesting points. On the runs using sodium carbonate in air, the platinum container

VOLATILIZATION EXPERIMENTS

Material	Temp. °F.	Gas Phase	Time	% Loss of Soda
Sodium Carbonate	1615	Air	20 mins.	1.0
	1800	Air	10 mins.	2.3
	1800	Air	20 mins.	6.8
	1815	CO_2	20 mins.	Nil.
	1790	Air and Steam	20 mins.	10.8
	1800	Hydrogen	10 mins.	32.9
	1800	Hydrogen	20 mins.	47.4
Sodium Sulphate	1560	Hydrogen	10 mins.	Nil.
	1560	Hydrogen	20 mins.	0.6
	1835	Hydrogen	10 mins.	3.3
	1835	Hydrogen	10 mins.	
		Nitrogen	20 mins.	9.2
	1860	Hydrogen	20 mins.	16.9
	1910	Hydrogen	10 mins.	9.1
	1910	Hydrogen	20 mins.	19.9

showed considerable attack, so the values may be open to question.

There can, however, be no question that the presence of steam causes a considerable increase in the volatilization of sodium carbonate, and the reducing action of hydrogen increases the sublimation loss to a very marked degree. In the tests on sodium carbonate, except where serious attack on the beat occurred, the sample lost more weight than it did soda, indicating a decomposition followed by sublimation. As would be expected, no loss occurred in a current of carbon dioxide.

The results on reduced sodium sulphate are quite interesting. Both time and temperature have a marked influence, and at temperatures of 1800 deg. F. or over, the loss may easily assume serious proportions. It would therefore appear that from the point of view of minimizing furnace losses, the temperature should be low, the char burned should be dry, the time of exposure of the smelt to high temperature should be a minimum, and the charge should not be swept with large volume of gas when at high temperature. It will be noticed that after reduction with hydrogen the loss continued to increase even in a current of nitrogen.

Soda mills have an advantage in not having to contend with the more volatile sodium sulphite, and as there is no question of reduction, it is not even necessary to fuse the soda. Water vapor accelerates the decomposition of the carbonate, and it is possible that combustion processes will furnish enough water to assist in the sublimation. Hydrogen which has such a marked influence may easily be present in the furnace. If a kraft smelter is operated with insufficient air for complete combustion, so that combustible gases appear in the flue gas, the largest proportion consists of hydrogen rather than carbon monoxide.

When soda recovery is made in a furnace in which the soda is removed in molten form, it is naturally necessary to operate a soda furnace at a higher temperature level than a kraft smelter, due to the higher melting point of the smelt. Sodium carbonate melts at 1564 deg. F. or about 200 deg. higher than the smelt from a kraft furnace. Kraft smelt is a mixture and has no sharply defined melting point. Our experiments on taking cooling curves on smelt samples, with a thermocouple immersed in the sample, do not give a sharply defined break, but rather a change in slope over the range of 1380 deg to 1330 deg.

We may therefore conclude that spray furnaces may deserve their reputation of high stack losses, although the cause is not mechanical entrainment of particles, but rather an actual volatilization of chemical. This loss is increased by the factors already mentioned, and in the effort to obtain the maximum of by-product steam, losses may be allowed to become worse than is actually necessary.

Soda that has been permitted to escape into the smelter flue gases is very difficult to recover. The particles are extremely small, and many are less than half a micron in diameter. Their specific gravity is about 2.6. This renders the task of recovering them in mechanical cyclones or separators almost hopeless. Wet scrubbers of reasonable size are of comparatively little use. Even when the gases are cooled below the dewpoint, so that a portion of the water condenses, the particles resist wetting and collection to a large extent. In blast furnace practice where large volumes of hot and dirty gas must be cleaned, it is necessary to employ mechanical washers for dust removal, due to the unsatisfactory performance of simple scrubbers.

The only reasonably satisfactory method of recovering soda is electrical precipitation, either wet or dry. The tail gases from a precipitation plant should not contain more than 15 pounds of sodium sulphate per ton of pulp. If the percentage recovery is pushed too far, the cost of installation increases out of proportion to the increased saving.

5. Cleaning Losses

Little need be said in regard to cleaning losses. The necessity for cleaning should naturally be avoided as much as possible. Clean black liquor without sludge or fibre will help to keep the evaporators clean. Good circulation in the smelter dissolving tanks tends to prevent accumulation of sludge.

In my opinion the most important factor is clean white liquor, which in turn produces clean black liquor.

A high percentage reduction and causticity help to reduce the losses caused by leaks and cleaning. A mill having a causticity of 80 per cent and a reduction of 75 per cent will carry in the system 10 per cent more total soda for the amount of active alkali, than one operating with a causticity of 85 per cent and a reduction of 90 per cent. This naturally results in a proportionate increase in the amount of soda lost by mechanical losses.

Summary

1. After washing, pulp contains soda equivalent to between 15 and 25 pounds of salt cake per ton of pulp adsorbed on the fiber, which does not appear from tests on the liquid. The amount should be determined for each mill, and the quantity found should be considered in any washing calculations or soda balance.

2. Lime mud contains insoluble soda in the form of a double carbonate of sodium and calcium. For most plants the amount lost in this way is about 15 pounds per ton. The quantity may be more, and cognizance should be taken of this source of loss when establishing causticizing procedure.

3. Lime re-burning causes some volatilization of soda, apart from loss by dust. The amount of this loss, and the extent to which insoluble soda may build up on repeated use is not known at present.

4. The loss from recovery furnaces is chiefly caused by a true sublimation or volatilization rather than mechanical carry-over. More consideration should be paid to the factors governing this action, in furnace design and operation.

5. Cleaning should be kept to a minimum. Clean white liquor is probably the most helpful factor in this regard.

Norwegian Paper Industry Active

WASHINGTON, D. C., June 30, 1937 — The favorable conditions which obtained in the Norwegian pulp and paper industry during 1936 continued at an accelerated rate during the first three months of 1937. The market has been characterized by a sustained foreign demand for all types of pulp and paper in the face of steadily rising prices. Exports declined slightly below the previous quarter, but they were well above the corresponding period of 1936.

Meeting Today's Standards of Paper Cleanness*

By F. K. Becker[1]

I believe it's customary for the reader of a paper at a meeting like this to spend the first few minutes in an effort to sell his subject and its importance to his listeners. Since I'm only going to take a few minutes altogether I'll plunge right into the subject, taking it for granted that none of us here have to be sold on the importance of this problem of getting and keeping dirt out of paper.

I don't think anyone will disagree with me when I say that the people who *sell* our papers and the customers who *buy* them have much more exacting notions of what constitutes *clean* paper than they ever had before. Standards of quality are, of course, relative but by and large what would have been cheerfully approved as No. 1 paper ten or even five years ago would be scorned by buyers accustomed to 1937 standards.

Keeping Pace With Demand

The point I want to register is that the means of making cleaner and cleaner paper have kept pace with the demand. I think I can speak with assurance on this point because I happen to be in a business that has devoted the bulk of twenty odd years to the development and construction of equipment for separating dirt from paper stock.

If you've already had a look at some of the newest equipment for this purpose out there on the Exhibit floor I don't need to offer you further proof of the statement that the means of cleaning paper have undergone a steady process of evolution. Modern equipment not only makes it possible to keep up with the stricter standards of cleanness and quality but with the steadily increasing pressure for higher and higher production per hour and lower and lower cost per ton.

Working Hand in Glove With Mill Men

Before I give you examples of what some mills are actually accomplishing along these lines it may be helpful to trace this evolution of paper cleaning methods and equipment up to the present. But first let me say that the purpose of these remarks is not to blow any horns for the builder of equipment. If there is one thing we have learned in this evolution process it is the value of teaming up with the individual paper maker to lick his particular dirt problem. There's no such thing as standardization of the dirt removal process. There are too many variables. What we do today is to apply the principles which time has proved sound in the way best suited to the individual requirements, and doing it means working hand in glove with the mill men. That success has been achieved in meeting today's stiff objectives is due as much if not more to intelligent cooperation from you paper makers as to the things we equipment builders have been able to contribute out of our multiple contacts and experience with all sorts of paper cleaning problems and conditions.

When you speak of "Evolution" you're apt to think in terms of centuries of time. But as a matter of fact the evolution of paper cleaning equipment has very largely taken place in our own twentieth century. From the time when there was no attempt to remove dirt until *after* the paper was made (when it was gone over sheet by sheet with a penknife) until the Inward Flow Rotary Screen was generally adopted was a matter of nearly a hundred years. Yet more has been accomplished toward efficiency of dirt removal in the twenty years since that time than in all the years previous. I wish we could have set up one of those original model screens alongside the 1937 model we have out there on the floor. The differences in appearance and engineering and operating convenience could not fail to impress you but the significant thing is how the fundamental principles inherent in both oldest and newest models have been applied to maximum advantage in the new screen. Let us review these principles briefly.

Fundamental Factors Stock

To deliver the maximum volume of clean, uniform stock to the paper machine wire your screens must have sufficient total slot area to permit the use of gentle screening forces and fine cut plates. When the finest slot for any given grade is used in combination with ample screening area plus gentle screening action, then and only then can screens operate to their maximum efficiency. Clean, uniform stock can be obtained in no other way, because the moment you upset the above conditions and force screens to make up for too little capacity you are bound to force dirt through with the stock. Uniformly gentle assisting force sufficient to help the fibres through the slots but not the dirt is an imperative factor and no less important is proper control of the movement of the stock through the screen. In the modern screen, both the heavy and light dirt rejected by the screen plates is quickly concentrated where there is no screening action so that there is virtually no opportunity for this dirt to pass through with the screened stock. The heavy dirt is continuously and immediately collected and discharged at the bottom of the screen. A quiet area is also provided at the discharge end of the screen between the vat and the cylinder into which the light particles float and discharge over adjustable gates into overflow compartments leading to the tailings system.

These fundamental factors in successful screening—large screening area, gentle assisting force, controlled screening action and rapid removal of rejects—have been built into the new screens in such a way that they are used and coordinated to maximum advantage.

Other Favorable Factors

In addition, the modern screen is more accessible, simpler, much easier to wash up and take care of—all of which has its effect on dirt elimination. The interior of the screen has been gone over to eliminate any possible source of strings or lumps. An interesting example of the sort of thing that is being done to meet current needs is the way in which the screen shower is handled. With finer and finer screen plates, shower pressures are necessarily greater and greater. This would introduce a serious dilution problem but for the fact that more efficient means for handling this shower water have been provided. An extra wide shower pan, made possible by the larger cylinder diameters now used, caches 85 per cent or more of the shower water so that it is removed from the system without getting into the stock at all.

In view of my previous statement about the importance of fitting paper cleaning equipment to individual requirements it is interesting to note that everything about these

* Presented at the annual convention of the American Pulp and Paper Mill Superintendents Association, Springfield, Mass., June 23-25, 1937.

[1] Vice President in charge of sales, Bird Machine Co.

new screens is so planned that it may be utilized or modified or eliminated as individual conditions warrant.

Results of Screen Evolution

Let's take a moment to examine the results of this screen evolution. No doubt many of you here are familiar with what some of these big new screens using fine cut plates have done to slash dirt count. Some mills are using plates as fine as .008 inch in the new screens where they had to use .012 inch or coarser with earlier model screens. In one such case they are running at 450 feet a minute with .008 inch cut plates and getting better than 33 per cent reduction in dirt count as well as much improved sheet formation, since the finer slots better individualize the fibers.

The practice of replacing old screens with new screens having the capacity to permit finer cut plates plus efficient screening action is so widespread as to require little comment. A sulphite bond mill that had two of our No. 2 screens with .016 inch plates handling about 4000 pounds an hour replaced them with two of the big 3A screens fitted with .010 inch plates. Dirt count was reduced 50 per cent. Another mill making book paper changed from screens with .014 inch plates to larger screens with .010 inch plates. They were getting 18 to 20 surface specks and are now getting 9 to 10—another 50 per cent reduction.

It is interesting to note that in the process of cleaning up their sheets may mills have secured a very desirable increase in machine production. One mill that recently put in four of our big screens figured that they were getting 10 per cent more production as well as cleaner paper because of the steady production of No. 1 paper they made possible.

Another Major Development

I think I need say no more about the better and more efficient use of these new, better and more efficiently screens and the effect it has had on paper quality, but I do want to cover, briefly, the other major development in the art of removing dirt from paper, namely, separation of dirt according to its specific gravity rather than according to its size. I don't need to tell you what I am referring to is centrifugal separation or centrifining. Particularly in the making of so-called fine grades, it is now clearly established that separation by both size and weight is virtually essential. Some kind of dirt will always get by the screens but not the centrifiners, and vice versa.

Sharper and More Thorough Separation

In centrifining, cleaning area is as important a factor as it is in screening. In the latest type of cetrifugal dirt separator the cleaning area is tremendously increased by employing three different centrifugal baskets. All of the stock is treated in each of the three different centrifugal baskets, each employing a different centrifugal force so that the efficiency of dirt removal is tremendously increased. With the constantly increasing fund of experience gained from the observation of centrifugal dirt removal in many different mills have come refinements in design that make for sharper and more thorough separation of both the very fine, heavier than fiber dirt particles and the very light dirt as well. If your particular headache happens to be rubber, as is the case with so many mills making rag content papers, you will find that modern screening and centrifining methods are vastly more efficient in the removal of both light and heavy rubber particles than the screening and centrifugal separation methods generally employed a few years ago.

Efficiency of Centrifiner Operation

Some idea of the efficiency of dirt removal that may be obtained by proper Centrifiner operation may be gathered from the following examples. In one fine paper mill, a 50 per cent rag ledger, 24 pound, showed a dirt count of 60 specks. After installation of Centrifiners the dirt dropped to 7.4, an 87 per cent reduction. A 50 per cent rag blue print paper from the same mill had its dirt count reduced by 84 per cent. In another mill the percentage of No. 1 sheets was increased from 55 per cent to 97 per cent. In another from 75 per cent to 85 per cent. In still another it was possible to reduce the furnish for each run by about 10 per cent because of the low percentage of rejects.

Stepping Up Production

There are two things worth bringing out about centrifining in adidtion to its efficiency as a dirt removal process. One is its ability to help step up production and the other its effect on operating economy. Some mills find that after putting in centrifugals the reduction in seconds and throwouts is so great as to be the equivalent of a big increase in production per machine per day. Other paper makes take advantage of the Centrifiner's ability to get the dirt just ahead of the paper machine to cut down their sorting time and expense, both on raw material and finished paper. Others find they can make as clean or cleaner paper than before with less expensive raw materials. The ability to get No. 1 paper off the machine right after start-ups is a noticeable advantage.

Efficiency as High as 85 to 95 Per Cent

On all grades now being centrifined the efficiency of the Centrifiner has proved to be as high as 85 to 90 per cent. However, I do not wish to leave with you the impression that it is a cure-all for dirt. It is simply an important and final part of the combination of equipment needed for real, lasting and uniform results—the combination of screen, auxiliary screen and Centrifiner. I could keep on talking for longer than you would care to listen on the advantages and the true economies of considering dirt removal as a unified job to be accomplished by the proper selection and operating of equipment best qualified for that particular job. I realize the difficulties. Fed of us have a free hand to work out a completely ideal system; we shall no doubt continue to compromise as best we can.

Evolution Goes On

I hope I have succeeded in registering a slightly sharper impression of some of the things that can be done and are being done to make paper that meets today's exacting standards of cleanness and at the same time satisfy today's demands for greater production and operating economy. Fortunately, perhaps, for the future of your business as well as my business we must always qualify remarks about papermaking methods and equipment with the phrase "subject to change". We who build the machinery haven't any idea in our heads that the evolution process has stopped. We'll keep right on trying to think up ways of doing the job better and to that end we bespeak the same fine and wholehearted teamwork from our friends in the industry without which we wouldn't be nearly as far along as we are today. With that cooperation and with the same brand of courtesy and patience you have been demonstrating in listening to me this afternoon I look forward to the time when I can again bring you a report of improvements as far reaching and profitable to you as those I have touched upon today.

Designing a Plant for Bleaching Sulphite Pulp*

By Walter L. Savell[1]

Although considerable variation in detail of treatment may exist from one mill to another, the bleaching of sulphite pulp is essentially a simple operation from the standpoint o chemical processing and plant design. The advantages or disadvantages of the several different variations in the bleaching process or the chemistry of the bleaching reactions will not be considered in this discussion. The present purpose is to outline the elements involved and principles which may be followed in establishing the design of a sulphite pulp bleaching plant satisfactory for a given set of conditions.

In its simplest form the process involves only two operations—mixing and separation. From the earliest application of the art until the present time, pulp has been and still is being bleached by adding bleach liquor (calcium hypochlorite solution) to the pulp and water mixture, mixing to insure the best possible contact between the pulp and the added bleach liquor, continuing the mixing until the chemical reaction is substantially complete and then separating the insoluble pulp from the soluble end products by filtration washing.

Even the most elaborate bleaching process involves nothing more than a series of these two elemental operations of mixing and separation. In the multiple stage processes the chemical reagents may be increased to three—chlorine, alkali and calcium hypochlorite.

Considering the pulp and water mixture as a constant for the moment, we then have a choice of pulp treatment involving three elements—one reagent (bleach liquor) and two mechanical operations (mixing and separation) or as many as three reagents (chlorine, alkali and calcium hypochlorite) and two mechanical operations repeated as many times as the individual application of reagents may demand.

Certain definite limitations in regard to plant design and materials of construction are established by the physical and chemical properties of the pulp, the chemical reagents used, the properties desired in the bleached pulp and plant capacity. They apply particularly to the multi-stage processes and should be considered even in a single stage bleaching.

These limitations affect the consistency of the pulp, processing time for a given treatment, temperature at which the pulp is treated and equipment size. We have, therefore, certain basic points before us dictating or influencing a bleach plant design.

Fundamental Elements Involved in Pulp Bleaching Process

Processing Operations	Reagents
1—Mixing	1—Chlorine
2—Separation	2—Alkali
	3—Calcium Hypochlorite

In multi-stage bleaching the processing operations will be repeated as the separate treatments are applied and may involve one or a number of steps, according to the number and order of application of the three reagents. Generally speaking, the range is from a single stage treatment involving calcium hypochlorite (bleach liquor) only, to a bleaching process of four stages involving all three reagents in a preferred order. Some few mills abroad have been reported to use as many as six stages in bleaching sulphate pulps.

The choice of bleaching process is clearly affected by several conditions—

Factors Involved in Choice of Process

1—Bleach Plant capacity required
2—Chemical and physical properties of pulp
3—Properties desired in finished pulp

Having made a choice of process, the factors involved in plant design may be considered.

Limiting Elements Affecting

Materials of Construction	Unit Design
1—Chemical properties of pulp water mixtures	1—Bleach plant capacity
2—Physical properties of pulp water mixtures	2—Physical condition of the pulp
3—Chemical properties of reagents	3—Consistency of pulp at a given stage
4—Physical properies of reagents	4—Physical properties of pulp water mixtures
	5—Physical properties of reagents
	6 and 7—(Processing time (Processing temperature

Because there are a number of details that must be considered, the bleaching process at times acquires an air of complexity and even mystery.

Examination of each factor and limiting element, however, shows its actual simplicity.

Operations

MIXING:

It is scarcely necessary to discuss this operation which is well known in its simplest form in the use of the hollander for single stage bleaching, sizing and coloring pulp.

SEPARATION:

The water washing of a treated pulp has been practiced for years in hollanders with washing cylinders and for a similarly long period by means of deckers.

Modern washers function on the same basic principle of dilution and filtering, but are naturally more efficient in operation. Most new plants install the cylinder type vacuum washers because of the greater economy and flexibility in operation.

Reagents

CHLORINE:

Used alone this element is highly reactive forming acids (hypochloric and hypochlorous) in contact with water. Capable of oxidizing or chlorinating most organic substances it forms oxidized and chlorinated compounds with the color bodies in sulphite pulp some of which are soluble and dark colored.

As a reagent in the first stage of a bleaching process, it is generally applied as a gas either dissolved and dispersed in water or directly to the agitated pulp water mixture if the treating unit is deep enough to permit dispersion and solution of the chlorine before it can bubble through to the top of the pulp suspension.

In shallow units the ejector is preferred for making the chlorine water combination as the partial solution and fine dispersion assist materially in distributing the chlorine through the pulp and increases the exposed surface of the added chlorine, and therefore the rate of solution in the pulp water suspension.

Since it is necessary to use definite proportions of chlorine in the pulp bleaching operation, it follows that dependable controls are necessary regardless of the mode of application.

For this purpose, there are two general types of equipment available:

1—Weighing directly from a container

* Presented at the annual convention of the American Pulp and Paper Mill Superintendents' Association, Springfield, Mass., June 23-25, 1937.
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2—Measured rate for a measured period of time at constant temperature and pressure

It is quite common to install a container having a capacity between 150 pounds and 2,000 pounds on a weighing scale with appropriate valves and connections arranged so the container may be filled from a tank car and discharged to the process at will. Such a system will use iron piping throughout except where the chlorine meets moisture and in making connections to the container on the scale. The latter connections are usually made of coiled sections of copper pipe. The greater flexibility of copper reduces the weighing error resulting from the attachment of the container to the fixed piping system.

As often arranged, the chlorine control of this type requires the operator to go from one point to another to operate control valves and to make observations of weight changes.

To avoid this inconvenience and possible attending irregularities in pulp treatment, a control unit has been designed, based on the weighing container principle, embodying some new and useful improvements.

Valves, gauges and weighing scale are mounted on the control panel. Such an arrangement makes it possible for the operator to control each step in the movement of the chlorine to the weigh container or to process without changing his position in front of the panel. He is also able to make all weight observations from the same position.

The mounting of the weighing scale on the panel is made possible by the application of the principle of proportional weighing. At a point back of the panel a cylindrical container is placed in a vertical position on its own foundation. The bottom of this container is a little above floor level. Suspended from the scale on the panel, a very small cylinder carries an amount of chlorine which varies with the amount in the large container. The levels of liquid in the two containers are maintained at the same point by connecting them together at top and bottom with flexible piping.

The scale is calibrated by filling the containers and establishing the weight contained in the small container at this point as the total weight in the two weigh containers —the small one suspended from the scale and the larger one behind the panel. From the known capacities of the containers the calibration proceeds as they are emptied. The scale is adjusted to use the entire range of the scale face from the empty position to the full position. In this manner, the highest possible degree of accuracy is attained.

The panel type weigh control is applicable to any batch chlorinating operation whether direct or by means of the ejector.

In operating the weighing system of chlorine control, liquid chlorine is admitted from the tank car to the weighing container. It may be necessary in starting up the system to bleed off some chlorine gas from the weighing container to the process. This is usually necessary when the control system is entirely empty to reduce the temperature and therefore the pressure in the weighing container to establish a pressure differential that will permit the weighing container to fill from the tank car. The chlorine gas withdrawn in this case is not measured and can only be roughly estimated. It may cause a slight over or under treatment of the first batch of pulp.

When the containers are filled to the established limit, the valve controlling the line from the tank car is closed. Liquid chlorine is withdrawn from the weigh container to a vaporizer and from there as gas to the ejector or directly to the pulp. A control valve between the vaporizer and the ejector or discharge point is used to regulate the chlorine flow as gas. Since the volume of the gas is so much greater than the volume of an equivalent weight of liquid chlorine, this valve permits closer regulation of the flow rate than could be accomplished by the valve on the liquid side of the vaporizer. When the container is nearly empty the last few pounds of chlorine should be withdrawn as gas. As previously mentioned, the temperature and pressure in the container will be reduced and the refilling accomplished more quickly. When the proper amount has been applied, the control valve between the weigh container and the vaporizer is closed.

After the liquid valve on the line to the vaporizer is closed, the vaporizer and lines beyond this valve are allowed to empty. Then the air control valve is opened and the pipe line is swept out with dry air. If an ejector is in use the air is drawn through a low pressure drier by the negative pressure which is established by the ejector when the chlorine flow is stopped. With direct chlorination the system is swept out with compressed air which passes through a drier built to take the necessary pressure.

The second type of chlorine control may take several forms. The variations are in detail only. The simplest form consists of an automatic pressure regulating valve, a fixed orifice and a shut off valve. With a constant pressure applied on one side of the fixed orifice a constant gas flow rate will be maintained against a constant back pressure if the temperature of the gas is constant. By using the shut off valve to start and stop the gas flow and regulating the time in use, definite quantities of chlorine may be delivered for batch chlorination. It will be recognized that this type of flow control is also applicable to chlorination in continuous systems.

In the simple form just described, there is one very serious disadvantage where accuracy is required. There is no indication to assure the operator that the gas is actually flowing or that the desired rate of flow is maintained. This fault has been recently eliminated by a novel method of utilizing the standard mercury well flow-meter in conjunction with the fixed orifice.

With continuous chlorination processes it is desirable to relieve the operator of almost constant attention to the chlorine control. Complete automatic meter control of chlorine flow becomes a practical necessity. Such control is common in the application of steam, air and other fluids, but the standard devices used for these materials are not adapted to use with chlorine because of the corrosive nature of this gas in contact with moisture and its oxidizing effect upon valve packings and lubricants. These conditions prescribe the use of packless valves for regulation and flow control.

Another flow indicator based on the orifice principle is available from an instrument manufacturer. The device is based on a variable annular orifice. A vertical glass tube internally tapered with the small end at the bottom is mounted in the gas line. Within the tube is a loose top-shaped part with small vanes. As the flow of gas is started this part is lifted in the tube until an annular orifice is established between the floating part and the tube to allow the gas to pass. The vanes on the float cause it to spin in the gas stream, which action tends to prevent it from touching the glass tube.

The glass tube is calibrated to show the various rates of gas flow for different positions of the float. The device called a rotameter is shown in Plate IV. Elaboration of the details permits the use of recorders with this instrument.

ALKALIES:

Two standard alkalies are in common use in sulphite bleaching operations with occasional use of others. Hydrated lime in the form of milk of lime suspension is most widely applied. Easily prepared and generally fa-

miliar, little comment on this material is required. Because of its low solubility, and relatively low pH, it is safely used in the dry form in some bleach plants.

Hydrated lime is used to neutralize the acid form as a result of pulp chlorination. The quantities applied are usually calculated to leave the pulp in a slightly alkaline condition as it goes to the first washer. In some plants the pulp is washed in the acid condition at the end of the chlorination period and any residual acid is neutralized with hydrated lime. In large plants the reduction in lime consumption is sufficient to justify this procedure. In continuous operations the application of lime is always in the form of the milk of lime suspension. The rate of application is regulated by one of a number of standard devices. Naturally, the supply tank must have agitating mechanism to keep the milk of lime uniform. Because of the nature of the reagent the flow control to process is most suitably of the constant head and variable weir type. A circulating pump delivers milk of lime from the supply tank to the constant head box from which the excess overflows back to the supply tank.

In treatments to produce high alpha cellulose pulps, of high white color, it is not unusual to treat the pulp with a solution of caustic soda after the washing which follows chlorination. Any of the standard forms of caustic soda may be used to make the treating solutions in iron equipment. Where the consumption and plant location justifies it, 50 per cent liquid caustic soda is most conveniently handled. Adequate information is available on the preparation of standard solutions and control of application, so extended discussion of this item is unnecessary.

The same is true of calcium hypochlorite solutions. For batch operation measuring tanks piped to deliver to the bleacher or mixer ahead of the bleacher have been used for many years. The constant head variable weir is also used in some instances. In other plants orifice type of flow control such as the rotameter is successfully used for controlling the flow of calcium hypochlorite to continuous bleaching operations.

Details of preparation and handling of calcium hypochlorite solutions are available elsewhere.[1]

Factors Affecting Material of Construction

CHEMICAL PROPERTIES OF PULP WATER MIXTURES:

Usually inert to most materials the only chemical consideration required in handling slush pulp is the avoidance of contact with soluble or easily corrodible materials of construction. Here again the experience of the industry is so extensive that the point scarcely needs elaborating. Generally speaking, slush pulp alone is handled with iron pumps, piping and fittings with certain conditions justifying copper piping, brass valves and other special metals. Wood lined or transite pipe and fittings are preferred in some cases.

PHYSICAL PROPERTIES OF PULP WATER MIXTURES:

The physical properties of pulp water mixtures create one of the most serious limitations in the choice of materials of construction in a well engineered bleaching plant. This has to do with the rapid reduction of fluidity as the consistency of the pulp increases. This means that pipe lines, chests, and, in fact, all surfaces with which the pulp is in moving contact should be as smooth as possible. Rough surfaces in contact with moving pulp not only create a tendency to cause dead spots, but also cause a serious power loss because of increased friction. Data on pipe line friction losses is available from stock pump manufacturers.

[1] Chlorine Handling and Bleach Make-up Equipment. W. L. Savell, Paper Industry, Feb., 1936.

CHEMICAL PROPERTIES OF REAGENTS:

The highly reactive nature of chlorine requires the use of suitable resistant materials in pulp chlorinators, pipe lines, pumps and washers coming in contact with the pulp while being chlorinated or with the chlorinated pulp prior to neutralizing. The majority of pulp chlorinators are either constructed wholly of acid resistant materials such as vitrified tile or are lined with tile. In each case the joints are pointed with acid resistant cement. Some pulp chlorinators have been constructed entirely of wood staves. This type of construction is inexpensive, but impermanent and invites trouble from shives as the staves wear. Other pulp chlorinators have been built of steel with resistant linings such as tornesite (a chlorinated rubber product) and have operated satisfactorily. Concrete stave construction with tornesite lining has been proposed but so far has not been used to my knowledge.

Rubber lined pumps, piping, fittings and rubber covered washers are generally used for handling chlorinated pulp in the acid condition. Transite pipe has been used successfully for conveying chlorinated pulp from the chlorinator to the washer. Concrete, exposed to the chlorinated pulp water mixture corrodes badly and introduces sand and gravel into the pulp. Wood stave pipe is not suitable for this service as the iron sheath is exposed at the joints and corrosion results.

All agitating equipment in the pulp chlorinators should be rubber covered. Some plants which have modified existing equipment have successfully used tornesite paint to protect iron agitators. Under other special conditions stainless steel has served suitably in equipment designed for other purposes and because of local conditions put into service as a chlorinator.

Chemical lead pipe is used to deliver chlorine directly to pulp water suspensions. The line may be of iron from the chlorine supply to the top of the chlorinating chest. Duriron ejectors, hard rubber and rubber lined steel piping, chemical lead and rubber hose may be used in ejector chlorination equipment where chlorine and moisture are present.

The use of alkalies in any part of the process causes little or no special consideration of materials of construction. Lime solutions or suspensions are relatively inert toward concrete, iron, tile or any of the other materials generally used. Caustic soda has little effect upon any standard material except concrete. It slowly dissolves portions of the concrete with the usual result. No alkali should have any occasion to meet aluminum, zinc or their alloys. These metals are rapidly disintegrated by alkaline reagents.

Calcium hypochlorite solutions rapidly destroy wood and seriously corrode iron. The latter, however, is sometimes used in contact with such solutions and is partly protected by a scale of calcium carbonate which forms on the surface. Where calcium hypochlorite is used in bleaching equipment, the chest is generally constructed of tile lined concrete or vitrified tile. Some few bleachers are of concrete construction without lining. Pulp movement is retarded by the relatively rough surafce of the equipment although the concrete itself is not seriously affected.

Measuring tanks, pumps, piping, fittings and flow control devices for handling alkalies are commonly made of iron.

PHYSICAL PROPERTIES OF REAGENTS:

There is little effect on materials of construction from the physical properties of the alkalies or calcium hypochlorite used. However, the fact that chlorine is a gas or liquid, maintained under pressure, does have a direct bearing on the subject. With pressures existing in chlorine lines and other handling equipment, it is highly desirable

to have such parts of extra heavy iron construction. All long lines should be well supported and the pipe not below the three-quarter inch extra heavy size. This size is prescribed as it is the smallest pipe size having sufficient rigidity for the purpose.

Liquid chlorine should always be conveyed in metal lines (iron or copper). It should never be passed through rubber lined or hard rubber piping as it disintegrates these materials.

Chlorine gas in the dry form is generally handled in metal lines previously described although hard rubber and rubber lined equipment may be used.

Factors Involved in the Choice of Process

BLEACH PLANT CAPACITY:

Where conditions require the bleaching of less than 25 tons of pulp per day, it is generally advisable to use a single stage process. This is gauged entirely on the total costs involved in the bleaching treatment. Local conditions may be such that smaller amounts of pulp may be economically bleached by a multi-stage process. Many pulp and paper mills have idle chests and other equipment which may be adapted to the bleaching operation. The possible reduction of installation costs in such cases may show economies in two stage bleaching at a figure as low as 15 tons of bleached pulp per day.

In bleaching 25 to 50 tons of pulp per day the saving resulting from reduced chlorine consumption is sufficiently important to justify an accurate estimate of costs on the installation of a multi-stage process. With a pulp having a 5 per cent chlorine demand, a saving of 20 per cent may be shown in the total consumption of chlorine. This amounts to a reduction of 20 pounds per ton of pulp bleached, or 75 tons of chlorine per year.

With pulps having a higher chlorine demand the reduction in the chlorine required to bring the pulp to a high white may be as much as 35 per cent. A plant bleaching 50 tons of pulp per day at 7 per cent chlorine demand may realize a saving in chlorine consumption amounting to over 300 tons per year. It is, therefore, obvious that for the larger tonnages a multi-stage process should always be employed as a matter of economy.

If a decision is reached to use a multi-stage process the question arises as to whether the pulp should be washed in the acid state after chlorinating or should alkali be added to neutralize all the acid formed and the pulp washed in an alkaline condition. Here again it is a question of economy. If caustic soda is to be used or large tonnages are to be bleached, the figures will quickly show that the pulp should be washed in the acid condition. The additional costs involved are covered in the installation of rubber lined pumps, piping and fittings handling the acid pulp to the washer and the rubber covering of the washer itself.

Where lime is used as the alkali the increased cost of acid-proof equipment may not be justified for small tonnages. Each case must be judged on its own merits and may be based on simple cost principles.

CHEMICAL AND PHYSICAL PROPERTIES OF UNBLEACHED PULP:

Some grades of easy bleaching pulp show so little economy when bleached by the multi-stage process that an original installation of this type would show no profit if used for such pulps only. This applies also to pulps purchased in sheet form, already chlorinated by the pulp producer.

The pulps having a higher chlorine demand not only show economies when bleached by the multi-stage processes, but will generally be brought to a standard color with less degradation. The most important factor affecting the degradation is the proportion of chlorine applied as calcium hypochlorite. It follows, therefore, that some pulps must be treated by the multi-stage process if the degradation is to be kept at a minimum.

The original condition of the pulp in a physical sense also influences the choice of process. Dirt or specks occasioned by the presence of particles of bark or knot residues are more completely removed when the pulp is bleached by a single stage treatment. This is due to the fact that more total bleach is used and at a higher effective concentration for a given consistency. It may be necessary to install additional screening capacity or other cleaning devices in order to treat such a pulp successfully by a multi-stage process. Proper cost figures will again indicate the advisability of using one process or another. If the pulp is purchased it is usually possible to adjust the pulp supply to the desired condition. In a mill making its own pulp the costs of cleaning the pulp must be balanced against the economies expected from the proposed change in process.

In some cases the application of the bleach liquor at high pulp consistencies in the second stage will assist materially in reducing the dirt count. The improvement is due to the fact that the addition of a given amount of bleach liquor results in a higher effective concentration of calcium hypochlorite at the higher consistencies. If 2 per cent of chlorine in the form of bleach liquor is required for the second stage treatment, it would give an original concentration in 3½ per cent consistency pulp amounting to 0.07 per cent. At a consistency of 18 per cent the concentration would be more than five times as great or 0.36 per cent. High consistency bleaching with constant agitation also induces some hydration of the pulp. This latter effect is most apparent with hard cooked pulps.

PROPERTIES DESIRED IN THE BLEACHED PULP:

If the best possible strength characteristics are required in the finished pulp the multi-stage treatment should be used with exceptions previously noted.

Treatment with caustic soda is especially desirable for pulps to be finished with a high alpha cellulose content. Such treatment is not desirable on pulps which are to have a high hydrating value when finished. With such pulps lime should be used to bring the pulp to a slightly alkaline condition after washing.

If the quantity of pulp to be bleached is small or the pulp is by nature adapted to a single stage treatment, this may be applied in a very simple manner. Hydrated lime may be added to the agitated pulp and after thorough mixing, chlorine may be passed into the pulp directly or through an ejector until the ratio of lime to chlorine is approximately 1.2 to 1.0. The calcium hypochlorite forms in the pulp water suspension. This method of applying calcium hypochlorite may be used in the multi-stage process also when the pulp is treated at consistencies not above 5 per cent.

The one principal objection to this type of process lies in the fact that the grit and other insoluble residues present in the line remain in the pulp less removed by special treatment. The condition may be improved by adding the lime as a milk of lime suspension from which the heavier particles have been removed by screening or partial settling.

The advantage of such a method of operating is that it eliminates investment in plant for preparing bleach liquor.

Superior strength characteristics have been claimed for pulp treated in the first stage with hypochlorous acid. This reagent may be prepared by passing a chlorine water solution over limestone in a packed tower. It may also be pro-

duced in situ by running chlorine into a pulp water suspension to which ground limestone or precipitated calcium carbonate has been added. Substantially the same effect may be obtained by adding milk of lime to the agitated pulp during chlorination, at a rate which keeps the mixture at a pH of approximately 6.8. This variation of process is not in common use.

Certain mills producing large tonnages of uniform pulp and bleaching to standard color have adopted continuous bleaching processes. The advantages of continuous processes are obvious. The principal disadvantage is in lack of flexibility.

Continuous single stage bleaching has been done for many years.[2] It is a high consistency process and is carried out by adding bleach liquor to a continuous flow of pulp delivered from a thickener to a high speed mixer. The pulp and bleach liquor mixture passes continuously through the mixer and is delivered to the top of a retention tower. The tower is built of such size that the bleaching reaction is substantially complete by the time any portion of the pulp reaches the bottom. A water jet and mechanical rake remove the bleached pulp at the bottom of the tower. At this point sufficient water is added to reduce the pulp to pumping consistencies and it is then delivered to the washer.

As the advantages of multi-stage bleaching have been recognized this process has been made to include continuous chlorination. For this part of the process the pulp is at a lower consistency. It is pumped to a head box above the retention tower. From this point it passes continuously down a rubber lined pipe and a short distance above the top of the tower the chlorine is admitted to the pipe through an annular distributor. The movement of the pulp through the pipe beyond the distributor gives sufficient mixing before the pulp reaches the retention tower. The tower size is suited to the retention time and the pulp removed at the bottom for acid washing; neutralizing and a second-stage treatment naturally follow.

Another continuous process is based on chlorination in a vertical cylindrical chest similar to the standard draft tube type of chlorinator. A continuous supply of pulp passes to the top of the draft tube. Continuous mixing is maintained and the chest is proportioned so the pulp will be retained for 45 minutes before it overflows to an annular launder attached to the top at the outer edge of the chest. From this point the pulp flown by gravity to a washer on the top floor of the bleach building. As the pulp sheet leaves the washer it is mixed with alkali solution in a puddler and drops into a rectangular chest. As the pulp moves through the chest to the overflow end it is kept in suspension by a traveling propeller type agitator. Retention period in this chest is one hour. At the overflow end the pulp passes to a second washer and another puddler which mixes bleach liquor with the pulp. Through a pipe it drops to another chest similar to the one described and dimensioned for proper retention period.

Another washing follows and in at least one instance a second treatment with calcium hypochlorite is applied and a fourth washing finishes the process.

Only two pumps are used in the entire plant. One to bring the pulp to the chlorinator and one to deliver the finished bleached pulp to the bleached stock chests.

The two bleach plants just described are the representative of complete continuous bleaching systems. Certain claims on improved pulp quality are made for the use of continuous chlorination under specified conditions. In this case the advantage is said to result from the possibility of quick application of chlorine and neutralizing after a very short retention period. With a batch process following chlorination any possible economies of continuous operation are lost in adjusting the two stages to each other. Lack of flexibility in the process also mitigates against convenient treatment of a variety of pulps or various degrees of bleaching often desired on a given pulp. The chlorine consumption is also somewhat higher than with the conventional two-stage process and economies of acid washing of the pulp are impossible.

Briefly, then, the continuous bleaching systems will show definite economies in plants bleaching large tonnages of uniform pulp to standard grades. To realize these economies the process must be continuous throughout.

Where a variety of pulps must be bleached or the pulp must be finished at different degrees of whiteness for a number of uses, the batch process must be used to obtain the necessary flexibility in operation.

In batch operation the choice lies between the single stage, two stage or three stage processes. With sulphite pulps a treatment of more than three stages is seldom if ever warranted.

Flexibility is highly desirable in a batch treating system as it is an advantage to be able to apply one, two or three stages of treatment on occasion as special conditions may dictate.

Factors Affecting Unit Design

PHYSICAL CONDITION OF PULPS:

If the pulp reaches the bleach plant in slush form, any one of several standard agitated chests may be used to mix either chlorine or calcium hypochlorite solution with the pulp. In some of the oldest bleach plants vertical or horizontal concrete tanks with paddle agitators are used for single stage bleaching. Other plants have used a wide variety of agitating equipment including beaters, stock chests and others. Equipment of the same kind has also been adapted to ejector chlorination.

Depending entirely on the agitation supplied within the various pieces of apparatus such bleaching was necessarily conducted at low densities. Under similar conditions this is also true of more modern equipment designed to act as mixers.

Pulp purchased in sheet form must naturally be broken and reasonably defibered before bleaching by any process. For many years the hollander fulfilled the double purpose of breaker and bleacher. Designed as a beater it is not particularly efficient as a mixer, but was made to serve before anything better was available. The hollander is still used for the same purpose in some mills bleaching small quantities of pulp by the single stage process.

More efficient pulp breakers are now available and where large quantities of pulp are handled they should be given preference over the hollander for breaking and single stage bleaching. They may also be used for the chlorination operation in the multi-stage process after the defibering action is reasonably complete. Consideration must be given to materials of construction as previously mentioned.

Pulp breakers of the type suitable for the double purpose of breaking the chlorination include special breaker beaters such as the Mid-West Fulton and the recently invented Vortex beater; also pulp breakers such as the Bellmer, Tugboat Annie and the Lybeck breaker.

In each of these pieces of apparatus the chlorine is introduced by means of the ejector.

Alkali treatment is also given in some cases in these breakers.

With calcium hypochlorite as the reagent, bleaching may

[2] Thorne Bleaching System.

be done at consistencies above 10 per cent. The agitating equipment for this type of operation is invariably of the ribbon type screw conveyor. Operating in a draft tube the pulp is lifted from the bottom at the center and discharged from the top of the draft tube. The Fletcher and the Wolf bleachers are typical high consistency bleachers. As these bleachers are inefficient mixers, it is common practice to add the calcium hypochlorite to the pulp as it comes from the preceding washer or thickener. A special puddler is used in some cases and in others the bleach liquor is added to the screw conveyor which delivers it to the bleacher. The most satisfactory operation is obtained when uniform mixing is accomplished before the pulp reaches the bleacher chest. If the pulp is clean it then will be bleached satisfactorily even though the bleacher agitator does not operate.

High consistency bleachers are also used in two stage treatments using bleach liquor in both stages.

It is well to keep in mind the fact that the only important function performed by any agitating machinery connected with the bleaching operation is to mix the reagent used with the pulp that is being treated. Because of the physical properties of pulp and water mixtures, and the natural limitations of agitating equipment, bleachers in general are inefficient mixers. For this reason, it is advisable where it is practical, to thoroughly mix the reagent with the pulp as it passes to the bleacher. Then the bleacher is required to function only to prevent the pulp from settling out during the period it must be retained to allow the bleaching reaction to complete itself.

BLEACH PLANT CAPACITY:

Unit sizes are naturally dictated by the tonnage of pulp to be bleached per day. In common with most processing equipment, the cost of bleaching apparatus per ton of capacity decreases as the size increases. For this reason, the cost of installation is proportionally greater for small plants. It, therefore, follows that the small bleaching plants use the single stage process and often carry out this operation in beaters, breakers or simple chests with agitators. Such units usually treat from 1,000 to 3,000 pounds of stock per batch.

The special units built for multi-stage bleaching seldom have capacities less than 3 tons or more than 6 tons per batch. Uniform agitation becomes difficult if the upper limit is exceeded.

Chests, pumps, washers and other accessory equipment are required to have capacities to permit the smooth handling of the pulp through the process at the required rate.

PROCESSING TIME AND TEMPERATURE:

The chlorinating reaction proceeds rapidly. It is, therefore, unnecessary to add heat to increase the reaction rate. Within 20 minutes after the chlorine is mixed with the pulp the reaction is substantially complete. If lime is added to the pulp mixture before washing, an additional period of 10 minutes will be required for reasonable mixing. In a chlorinating chest having a depth of 20 feet or over the chlorine may be added directly at a rate of 20 pounds per minute.

With the ejector, the chlorination rate is dependent on the ejector size and water pressure. Used with the shallow type of chlorinating equipment as previously explained the content of chlorine in the water may be 50 grams per liter or more. In very shallow beaters the concentration is adjusted to give complete absorption of chlorine in the pulp mixture.

Under extreme conditions the chlorine water may be as low as 10 grams per liter.

The reaction rate between calcium hypochlorite and the color bodies contained in the pulp and the pulp itself is relatively slow. In common with many other chemical reactions the rate is increased as the concentration of reagent and the temperature increase. Concentrations are naturally adjusted to the chlorine demand.

High consistency favors rapid reaction because of the higher initial concentration of reagent. However, as the reaction proceeds and the concentration decreases it is common practice to add steam to the bleacher contents until the temperature is between 100 deg. Fahrenheit and 120 deg. Fahrenheit. Optimum conditions demand that the temperature should not rise much above 105 deg. Fahrenheit, as the degradation of pulp is greater at higher temperatures and calcium hypochlorite is converted to calcium chlorate at a measurable rate.

The latter compound does not have any bleaching action and if the pulp becomes acid in its presence degradation is increased.

At a temperature of 105 deg. Fahrenheit single stage bleaching or the second stage treatment is complete in a period of 210 minutes.

Co-ordination of Process and Treating Units

Having made a choice of process and types of units to be used, it is possible to establish unit sizes, pump capacities, pipe sizes, chest, washer capacities and other details of the bleaching installation by the use of a simple time cycle chart.

By using the time cycle chart to follow each batch of pulp through the complete process under or oversized equipment is quickly spotted and design may be altered to obtain proper coordination.

This device for visualizing the complete process is one of the most effective aids in developing the most economical plant design. It will show, at a glance, whether equipment or chests already on hand, may be adapted to the process and where the bottle neck of the process may be, if increased capacities are required.

Essentially simple as a process, many details must be given consideration in the design of a plant for bleaching sulphite pulp. These details are always influenced by local conditions. An analysis of any plant design by means of the time cycle chart will visualize the process and indicate possible plant capacities and changes necessary to improve or increase production.

It will be recognized that the same principle of time cycling may be applied to the analysis of many other operations to locate process bottle necks and oversized equipment.

3. Bleaching of Wood Pulp VII Effect of Agitation, etc. D. K. Baird and R. H. Doughty—Paper Trade Journal, Nov. 29, 1928.

Watermark No Longer Required

An Uruguayan decree announced in Montevideo, to become effective 60 days after promulgation in the Diario Oficial, modifies the previous regulations for the duty-free entry of printing paper so that a watermark is no longer required, according to a report from Consul Augustin W. Ferrin, at Montevideo.

According to the new regulations printing paper must arrive in rolls measuring over 54 centimeters in width, but need not be watermarked, except that for printing books. Owners of importing printing establishments must register with the direction general of customs and must submit to control by the Ministry of Finance.

Newsprint paper not fulfilling the above requirements will be dutiable at 0.07 peso per net kilo plus a surtax of 21 per cent of an official valuation of 0.16 peso per gross kilo.

Riffling of Groundwood Pulp*

By R. I. Wynne Roberts[1]

The riffling of a pulp suspension to eliminate, or at least inhibit, dirt in the finished sheet has been a subject to which considerable thought has been directed. It is only in the past decade that the design of rifflers has been given considered attention, and has been based on a logical approach to the problem.

There are, today, many designs in vogue, partly developed as a result of a cut and try policy, and partly from prior knowledge of the controlling factors involved. In order to clarify many misconceptions as to the purposes and performance of rifflers I should like to answer some of the major questions that invariably crop up when a riffler is under consideration.

Factors Affecting Riffler Efficiency

Obviously the prime purpose of a riffler is to settle or deposit, within a limited area, as much of the grit, dirt and other extraneous material that may be entrained in the pulp suspension. To accomplish this there are five principal factors upon which high efficiency depends, viz.,

1. Speed of flow of the stock thru the conveying channel.
2. Consistency of the pulp suspension.
3. Place of baffles.
4. Length and width of the riffler.
5. Installation factors.

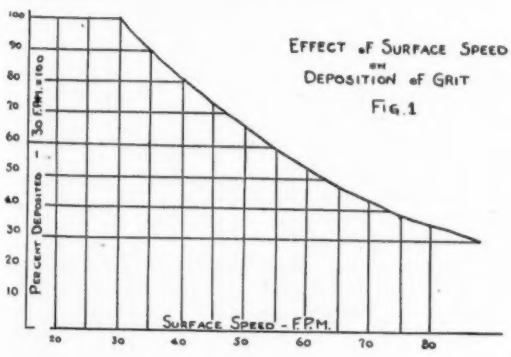
In order to establish the effect of these variables upon the efficiency of deposition I shall review each separately.

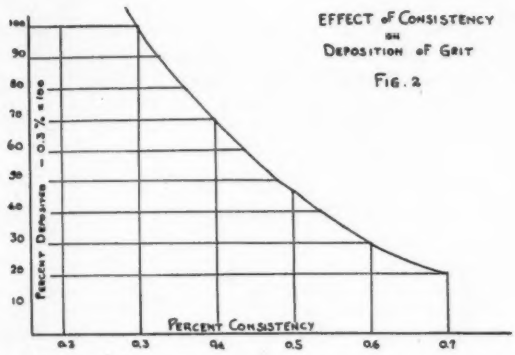
Speed of flow.

The ordinary inference in using the term speed of flow is the surface velocity of flow of the pulp suspension in feet per minute. The average speed of the whole layer of liquid flowing above the baffles may be less than the surface speed due to the deterrent effect of friction; however, the surface speed may be safely taken as a measure.

The effect of a change in surface speed upon the riffler efficiency is graphically pictured in Fig. 1. It will be noted that as the surface speed is increased the amount of material settled out rapidly decreases. It is quite apparent that for high efficiency a surface speed of less than 40 f.p.m. is required approaching 30 f.p.m. to obtain maximum performance.

There is a limit, however, to the reduction in surface speed, as below 25-30 f.p.m. the pulp starts to separate along with the grit and dirt. Hence for practical purposes a minimum of 30 f.p.m. may be set, although mill operating conditions usually require a speed somewhat higher than this.





Inasmuch as the volume of flow over the last baffle of the riffler will be related to the cross-sectional area of the channel through which the stock flows, it follows that as the width remaining constant, the depth of the stock over the baffles will be proportional to the flow. Hence to maintain a surface speed of around 30 f.p.m., stock approximately one inch deep will flow over the last baffle (which is in effect a weir). As the head over the last baffle increases, so will the stream velocity through the riffler.

Obviously to obtain as low a head of stock as one inch will require a relatively large riffler area. The commonly used expression, "square feet area of riffler per ton of pulp" is misleading unless the tonnage is specified at a known consistency. Square feet area per volume of flow would likely be a better measure of the area necessary.

Consistency of stock.

Second in importance among the process variables affecting riffler efficiency is the consistency of stock flowing through the riffler.

The effect can be gauged from Fig. 2. It is evident that as the consistency increases the rate of deposition of grit and dirt falls so that at consistencies much above 0.5 per cent the riffler efficiency is low.

There is a minimum consistency condition pervailing that is partly established by the limitations of practibility and partly by virtue of the fact that the increase in deposition at consistencies lower than this is not proportionately as great.

The consistency should be held at 0.3 to 0.35 per cent. Below this better riffling will be experienced, but the volume of stock becomes too large to handle effectively, and furthermore, the cleanliness of screening will be adversely affected. As a matter of fact, as low a consistency as 0.3 per cent is sometimes undesirable due to difficult screening conditions, so that a compromise in consistency above this figure or a special layout is necessary. If the consistency is raised it becomes that much more essential to keep the stream velocity to the minimum that can be maintained.

Because riffling is best accomplished at low consistencies the riffler should be placed after the screens, or in other words at the point of lowest consistency in the stock system. A further advantage of placement here is the

*Presented at the annual meeting of the American Pulp & Paper Mill Superintendents' Association, Springfield, Mass., June 23-25, 1937.

[1] Member TAPPI, Norton Co., Worcester, Mass.

fact that knots and large wood bundles have been eliminated and do not add to the load to be carried by the riffler.

PLACEMENT OF BAFFLES.

On this matter there exists considerable confusion of ideas.

At low consistencies and surface speeds the baffles, both in respect to position and method of placement do not markedly affect the rate of desposition. This presumably is because under ideal conditions the settlement of dirt is natural and requires no secondary assistance.

At higher consistencies and surface speeds the baffles become more important. The better results are obtained by placing the baffles at an angle of about 45-60 degrees in the direction of flow, although at this angle the spacing should be such as to avoid overlapping of the top edges so as to interfere with the free washing of the rifflers.

At higher surface velocities the vertical baffle has a tendency to produce eddy currents in the area between two successive baffles, which will stir up and keep in suspension those dirt particles which are trying to settle out. It does not need to be emphasized that the settling of dirt and residue will take place where the stream velocity is slowed down or practically zero.

The spacing of the baffles is not consequential at low consistency and surface speed but with increasing velocity of flow becomes more important. At higher stream velocities a spacing of from 18-24 inches gives the better results. It would appear that the spacing at high velocities is dependent upon the limiting of eddy currents and whirlpool action so that spacing too far apart results in excessive sweep-out in shallow baffle sections removing the deposited material.

The depth of the baffle will depend upon the velocity of flow and the time between wash-out. At low velocities the depth is purely dependent upon the capacity required to accumulate several days deposit of residue. At higher velocities, exceeding 50 f.p.m. depth is necessary to prevent scouring of the riffler bed.

A satisfactory depth for average operation is 4 to 6 inches which will limit the volume of stock wasted on a washout and provide an adequate volume for the collection of dirt. If the stream velocity is maintained at a higher figure, exceeding 50 f.p.m., additional depth should be provided. If the depth is too shallow and the stream velocity high, much of the deposited residue will be swept out.

LENGTH AND WIDTH OF RIFFLER.

The length of riffler necessary to settle the greater part of entrained dirt in the stock will to some extent depend upon the nature of the dirt and more particularly upon the consistency of the stock and the stream velocity.

Assuming that reasonably ideal conditions exist, i.e. low consistency and stream velocity, the minimum length that will satisfactorily settle out the major part of the dirt is 50 feet, although 60 feet is preferable. There will be more dirt settled out for lengths greater than this but the additional quantity per foot length will be much less.

Sixty feet is a good practical length that, ordinarily, can be fitted into the mill layout. In this length, maintaining velocities less than 40 f.p.m. and consistencies around 0.35 per cent grit of all sizes down to approximately 250 mesh can be separated. Fifty-mesh grit (about 0.018 inches average diameter) of a density equal to river sand, artificial abrasive, coal cinders etc. settles out in the first ten feet and the last of the 250-mesh deposits in 60 feet.

The distance in which different sized grit falls will obviously be dependent upon the density of the material as well as the size of the particles. Artificial abrasive of equal dimension will settle more rapidly than say quartz as the densities are in the ratio of 3.1 to 2.5. If a high surface speed is maintained, the horizontal displacement of the particles will be very large, hence requiring a marked increase in riffler length to settle out the finer particles. Some idea of the length required to precipitate different sized grit is given in Fig. 3.

A particle falls in still water by reason of an unbalanced force represented by the excess of its own weight over the weight of an equal volume of water it displaces. Against this fall is opposed the mechanical resistance of the water, this resistance being of two kinds.

When the velocity of fall is relatively great, as with large particles, the action of the falling must remove water from the line of fall, impressing on the water velocity and movement, which is finally absorbed in eddies. This is known as eddy resistance.

When on the other hand the velocity of fall is small, as with small particles, eddy resistance is negligible, the controlling resistance being due to the viscosity of the water, or in other words the skin friction with the particle surface. This is classed as viscous resistance.

At about a grit size corresponding to 50-mesh these two forms of resistances overlap, so that particles above this size fall into the category of eddy resistance while those smaller respond to viscous resistance. With the larger particles it can be shown that they fall in proportion to D^2 where D is the diameter. For the smaller sized grit, the fall is proportional to $\sqrt{D}$. In both cases the fall is also related to the density of the grit material.

When, as in a riffler, there is also a horizontal movement of the water a further factor is introduced. The vertical element of descent is the same as the fall in still water but in addition there is a horizontal displacement of the particle in the direction of flow. The fall is, therefore, while governed by the response to gravity, more or less downward in a diagonal direction. Since larger and heavier particles fall more rapidly they are not subject to much horizontal movement, but the finer particles are carried forward for an appreciable distance while settling, necessitating considerable length to the riffler.

Having thus established that 60 feet is a suitable length for a riffler, the width required to handle a given tonnage is the next problem. For conditions of best efficiency a speed of not over 40 f.p.m., preferably less, and a consistency of 0.35 per cent or less are required. Hence 45 gallons per minute of flow will be necessary for each ton-day handled at an approximate head of one inch over the last baffle. If an inch flow over a weir is equal to 3 gallons per minute per inch width, then 15-inches width of riffler will be required for each ton-day of stock flowing through the riffler.

Under these conditions the area required per ton of

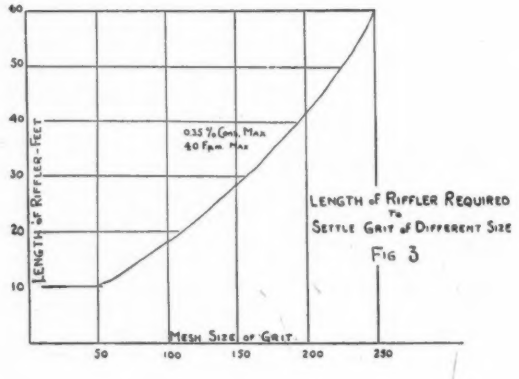


FIG 3

pulp amounts to 75 square feet, a figure that is much higher than that frequently quoted as adequate.

INSTALLATION FACTORS.

The design of a successful riffler requires close attention to details beyond the computation of size to meet low stream velocity and consistency requirements. Apparently secondary features, usually ignored, will do much to vitiate the results obtained.

The baffles must be level for the full width of the riffler so that the flow over them will be uniform. If not level, the baffles will cause cross currents and eddies in the flow which will disturb the even settling of the dirt. It is desirable to have the top edge of the baffles one inch below the level of the last baffle so that the flow over them will be smooth.

The stock flow to the riffler must be carefully regulated so that at no time will enter in surges. A riffler can be made to handle a larger quantity than originally designed for if the increased flow is admitted slowly, but surges are fatal to high efficiency as the sudden influx of stock causes violent disturbances between the baffles. These will scour out the deposited material, carrying it along with the stock to the deckers. Each riffler should be provided with a control gate that will regulate the volume allowed to flow into it. Too much emphasis cannot be laid on the imperative necessity of avoiding surges in the flow to the riffler, which should, also, be without head so that foam and its attendent evils will be avoided.

As mentioned previously the riffler should be placed at the point of lowest consistency in the stock system, which is usually after the screens. Some mills find it impossible to screen at a consistency much lower than 0.5 per cent and get clean stock. This difficulty has in some cases been overcome by taking stock from the knotters diluting to 0.3 per cent, riffling, thickening again to 0.5 per cent and then subsequently screening. The white water from the thickeners is used to dilute the incoming stock. This requires additional equipment but it is justified by the superior results obtained. Failing some such scheme as this, it is important to reduce the riffling consistency as far as possible, although if it cannot be carried to below 0.4 per cent the greater part of the benefit of the riffler is lost.

It is customary to wash out the riffler about twice a week. If the amount of residue is large and shallow baffles are used it may be necessary to wash out more frequently. The baffles should be made as shallow as justified by the operating conditions so that the waste of stock, on washing out, will be at a minimum.

Riffler Construction

As a matter of convenience, both in construction and operation, rifflers are usually installed in bays 10-12 feet in width and sixty feet or better in length. The riffler may be constructed of smooth finished concrete or smooth surfaced lumber such as yellow or white pine, B.C. fir. Wolmanised lumber has worked out to good advantage.

If space is a limiting factor the rifflers can be built in double or triple tiers allowing sufficient vertical height between rifflers, say three feet, so that each can be washed out without difficulty or interference.

There are a number of different designs of rifflers that have worked out with satisfaction in point of facility of wash out. A design that seems to be quite general and that has a number of advantages is built according to the description following.

The floor of the riffler, in its width, is pitched 1/48 so that deposited material will be washed out easily. At one side a gutter runs for the full length of the riffler, recessed below the plane of the floor, about one foot deep and one foot wide. At suitable and conveniently spaced intervals wash out drains of adequate size are provided, either three or four in number in a sixty foot length. The gutter is pitched sufficiently in the direction of flow so that rapid and complete washout is accomplished.

The baffles are shaped to fit the slope of the floor and extend the full width of the riffler. Hence, they extend over and across the recessed gutter permitting the free flow of the washout water to the drain. In this way the baffles may be fixed permanently in position and may be kept level at all times. The vertical height of the baffles should exceed four inches and should be designed for the particular conditions under which the riffler is to operate. For example, an increase in stream velocity will necessitate a greater depth, as will a heavy settling load or an extended washing interval.

The inlet channel to the riffler needs special consideration. The flow into the riffler must be baffled to produce a smooth even flow of stock which must be free of any churning tendency or foaming effect, resultant to a discharge under a head. A control gate at the head of the rifflers is essential so that any tendency to surge will be held in control.

Riffler Efficiency

The efficiency of deposition will depend upon the many factors already discussed. In numerical terms 90 per cent may be considered a good efficiency. There will be some grit finer than 250 mesh that cannot be successfully settled within sixty feet, so that 100 per cent efficiency is usually an impractical ideal. Any reduction in efficiency below 90 per cent may be considered as loss in effective settling due to excessive stream velocity or too high a riffling consistency.

In order to determine the efficiency of a riffler it is necessary to measure the dirt in the incoming stock and that remaining in the stock after riffling. It is, therefore, necessary to submit a representative quantity of stock to the most ideal conditions of settlement both before and after riffling.

To accomplish this it is desirable to build and use as a permanent accessory to the riffler system small test rifflers that will settle out practically all available dirt. For this purpose a riffler some 12-15 feet in length and 15 inches wide is suggested. The discharge from a baffle overflows into a restricting channel created by placing a partiition wall some 2-3 inches in front of the baffle reaching down to within three inches of the floor. Thus a series of baffle sections are built consisting of the baffle and a partition wall, by means of which the stock is required to flow over the baffle, down under the partition wall and then upward through the enlarged section between baffles, and then overflow the succeeding baffle. The baffles are placed about 10-12 inches apart.

The baffles should be held in position by wedges or lock keys so that when washing out they can be lifted clear of the floor. The riffler walls and floor should be lined with a smooth surfaced white fabric, such as heavy weight oil cloth or apron cloth.

The inlet box is baffled so that the flow will be evened by the time it reaches the first section. A V-notch weir is placed at the end of the last section so that the flow may be measured. A drain hole is cut in the floor of the last section. A consistency sampling device is desirable to obtain a representative sample.

A very small flow of stock is admitted and diluted by the addition of fresh water to less than 0.15 per cent and the riffler run for 24 hours. The stock is then shut off allowing the diluting water to remain on. In a short period

all of the supernatant stock layer will be washed away gently without disturbing the deposited material. When the liquid mass is clear, the drain plug is gently lifted and the water permitted to slowly drain away through a box covered with a 250 mesh wire. When all of the water is out a hose is used to wash out all remaining dirt from the surface of the oil cloth (which being white shows the dirt in relief.)

If the fresh water used for dilution contains much grit it will be necessary to run several tests on the water alone to determine the grit content, which can be subtracted from the grit measured.

The deposited material from the riffler collected on the 250 mesh wire is washed onto a filter paper placed in a Buchner funnel. The paper and dirt is then ashed in a crucible and the weight of dirt calculated. The volume of stock through the riffler, measured by the V-notch weir, being known, the grit content per ton of pulp can be determined.

By having two test rifflers, one at the head of the main riffler and the other sampling the riffed stock, both running concurrently, the grit content of the stock before and after riffling can be measured, thus determining the efficiency of the mill riffler. The daily determination of the efficiency is desirable so as to have a measure of the settling process and to uncover any unusual conditions tending to loss in effectiveness of the riffler.

As conditions vary from mill to mill it is difficult to state definite limits for the grit content of riffled groundwood in grams per ton of pulp. However, a conservative figure of 5-8 grams may be considered good practice. With adequate riffling area under suitable operating conditions this figure should be reached and maintained.

Summary

Summarizing the various facts reviewed in this paper it may be said that the essential factors in the design of a riffler are as follows:

Length—50 feet minimum, preferably 60 feet.

Width—15 inches per ton of pulp at 0.35 per cent consistency and 40 f.p.m. maximum.

Stream velocity—30 f.p.m. or as near to this as possible. A flow of one inch over the last baffle.

Consistency of stock—0.3-0.35 per cent or as near to this as possible.

Baffles—4-6 inches vertical depth, spaced 18-24 inches apart and slanted 45 degrees in the direction of flow. Must be level.

Installation—Elimination of all surges. Discharge into riffler without head to prevent foaming.

Construction—Smooth surfaced concrete or wood.

Modern Mechanical Drives for Paper Machines*

By Robert L. Wickes[1]

Men who have made a lifetime study of paper manufacturing have a great many different problems to consider. And not the least of these, is the problem of making those paper machines go continuously and at maximum profit. To keep these dozens of rolls in the paper machines all going constantly at just the right relative speed is the biggest power transmission problem in the paper mill. It was consideration of this problem that led me to make a special study during the past nine months of the drive problems in paper mills and especially on paper machines. Looking at the problem from the point of view of a power transmission engineer, during these nine months I have visited 106 paper mills from Maine to Minnesota and as far south as Florida, picking out the facts on the drive problems of paper mills and especially paper machines.

Three Main Types of Drives

In general, there are three main types of drives: the old Marshall drive has a number of disadvantages. The gears are dirty, noisy and dangerous, being as they are, completely open. The clutches are forever burning out, and the small size of the cone pulleys, and the low belt speed used both contribute to belt trouble. It is only fair to admit that only a few years ago, there were no leather belts available which would operate these machines during their initial run without needing to be taken up, causing loss of production during the resulting downtime.

The next development in point of time was the Walmsley drive or English drive. This eliminated the bother with clutches and open gears, but it introduced the further difficulty of consuming a large amount of space in the cellar. It is also quite a costly drive to install and also costly to maintain, although it must be said that it operates the machine very satisfactorily, giving reliable, smooth operation, allowing the making of a high quality of paper with small paper breakage. But because of its high equipment cost, high installation cost and high maintenance cost, it resulted in reduction of the profit through high cost per ton of paper produced.

The next development was the individual motor sectional electric drive. This introduced the advantage of saving of space over the Walmsley drive and also the brand new advantage of push-button control of the sectional speed. This system represented a definite advance in power transmission on paper machines because it brought complete freedom from shutdowns due to clutch or belt trouble, but substituted certain inherent difficulties peculiar to itself, one being its very high first cost with consequent high carrying charges. These electric drives have established new highs in initial cost because of the high cost of electrical equipment, and because with the sectional drive three times as much horsepower as the average load has to be installed to take care of the starting loads of the various sections.

The electric drive also increases the cost of operation, because a whole electric maintenance crew is necessary, and operators have to be employed who understand the operation of this electrical equipment. Most present machine operators are not qualified successfully to operate this system. The controls are very complicated and very expensive to install. In an old mill that has been motorized, they are difficult to keep in order, besides being even more expensive to install than in a new mill.

Modern Mechanical Drive

The paper machine manufacturers can now provide you with the Modern Mechanical Drive, the latest development in driving paper machines, designed to provide you with the simplicity and ease of operation of the low-cost mechanical drive, to enable you to purchase high-production

* Presented at the annual convention of the American Pulp and Paper Mill Superintendents Association, Springfield, Mass., June 23-25, 1937.

[1] Research Engineer, American Leather Belting Association.

paper machines, which regular paper machine operators can run successfully. In general, it uses the principles of the Marshall drive, taking advantage of that drive's space-saving features together with other recognized advantages and improvements, which eliminate the weaknesses of the old Marshall drive and result in the most economical and efficient system of driving today.

Fig. 1 shows the line shaft of such a modern mechanically-driven paper mill, making newsprint at 1,400 f.p.m. The variable speed shaft has been speeded up to 450 r.p.m. All the bearings are of the anti-friction type, such as either ball bearings or roller bearings. The DC motor direct connected to the shaft with electronic speed regulator provides uniform shaft speed. The cone pulleys are large. This one in the illustration is 41 inches in diameter at the large end. The tapers are gradual. The taper of this cone is ¾ of an inch per foot of width, and the belt speed is 5,000 f.p.m., making it a drive that will reliably carry a tremendous amount of power. The large pulley diameters allow the belts, which are by the way modern leather belts of low stretch characteristic and high friction surface, to provide continuous production at 1,400 f.p.m. at extremely low operating costs. This mill is well known in the mid-west as a very profitable paper mill. It has been a money-maker ever since this machinery was installed.

In considering the part of the drive on the machine floor, Fig. 2* supplied by a paper machinery manufacturer shows the tremendous improvement at this end applicable to any machine using this modern mechanical drive system. Here again, we have a large cone pulley, enabling the leather belt to grip the pulley firmly and still transmit sufficient power continuously for maximum uninterrupted production. The shaft for the cone pulley runs in anti-friction bearings. The shaft for the pinions runs also in anti-friction bearings, and, in fact, all the bearings throughout this drive are of the anti-friction type.

A Major Improvement

One major improvement is these cut steel hypoid gears which will provide a lifetime of smooth, chatter-free operation of the machinery with no back lash and no vibration, which means highest desired paper speed can be continuously maintained. High-speed, continuous operation with this type of machinery is a fact established through years of successful, profitable operation.

Note that these gears are totally enclosed, running in a bath of oil. This means smooth, quiet, troublefree operation, clean paper, and a clean mill.

Perhaps, no single item in the modern mechanical drive has been so improved as the clutches. These electrically-controlled clutches, operated by a rheostat from the front of the machine, have ample capacity for the heaviest loads and are successfully operating the biggest machines in the newest mills throughout the East, West, and South. This clutch can be adjusted by simply pulling out a pin, sliding the disc around, which moves it forward on the shaft, and letting the pin fall into place again in less time than it takes to tell about it, thus practically eliminating maintenance time for clutches.

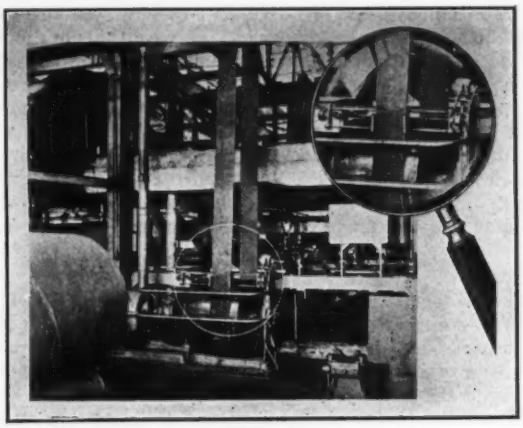


FIG. 3.
How the push-button control works.

The throw-in of these clutches is controlled by a magnetic device, which controls the speed of throwing in the clutch, so as to provide, automatic, smooth starting. Even the most inexperienced operator can start a section equipped with this type of clutch with perfect smoothness and ease.

Push-Button Control of Section Speed

Another tremendous improvement in the Modern Mechanical Drive is the provision of push-button control of the section speed. This push-button control for shifting of the belts is also handled from the front of the machine. As we see in Fig. 3, the belts are shifted by means of a ¼ horsepower DC, reversible, totally-enclosed electric motor. The motor drives the screw on which are mounted the shifter forks. Wires from the motor are run to the front of the machine, so the operator, by pushing one button, can speed that section up; and, by pushing the other button, can slow it down, to regulate the draw instantly and with infinite precision of positive control. The response to this mechanical control is practically instantaneous. The characteristic of electric equipment which causes so many paper breaks with that type of drive is entirely absent in

* Picture referred to not published in this article.

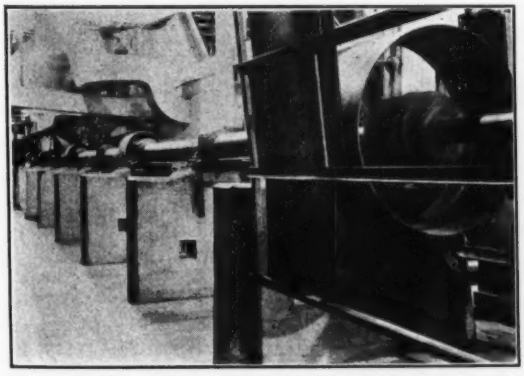


FIG. 1.
Line shaft of modern mechanically driven paper machine.

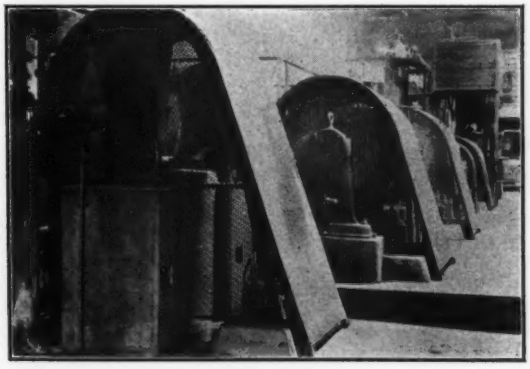


FIG. 4.
Wet end drives of modern mechanically driven paper machine.

the Modern Mechanical Drive. The instant response to this push-button control allows such fine variations and control of the sectional speed that the machine can be run at the top speed for each grade of paper with the greatest of ease, giving maximum paper production at lowest possible cost. This rapid response to the sectional speed control, by making it easy to regulate the draw rapidly and accurately, makes it easy and economical to adjust the speed for each grade of paper to the maximum possible speed at which the machine will make that grade of paper.

Accurately Controlled Drive of Each Section

The Modern Mechanical Drive, provides positive, accurately-controlled drive of each section keeping the proper tensions on the paper, thus enabling the machine to make more uniform paper and increasing production by lessening the number of paper breaks.

Fig. 4 shows the wet end of the 1,400-feet-per-minute newsprint machine, of which the shaft drive is shown in Fig. 1. Note how the drives are guarded. You can see in the illustration the belt-shifting motors. Of course, both the push-button control for the belt-shifting motor and the rheostat for the magnetic clutches are on the front of the machine.

Fig. 5 shows the drier drive of the same machine. Observe the Silent Chain Drive on the drier rolls. This permits blowing the paper, in case of a break, out through the back of the machine, which, of course, speeds up production tremendously by lessening the time to get the machine started again. Also, observe how they carry off the tons of water evaporated in these driers.

One drier section drive is in the foreground. Note the belt-shifting motor. Fig. 6 shows the detail of this drive and motor. Notice the strength and simplicity of the drive and of the little belt-shifting motor, providing continuous trouble-free operation and enabling this mill to get the high production which enables it to be so profitable.

This machine makes newsprint at 1,400 f.p.m., running twenty-four hours a day, seven days a week. They shut down one day per month on this machine. During the four years this machine has been running, they have had no shutdown time chargeable to the drive. All drive maintenance that has been necessary has been done during shutdowns for other work.

One of Largest Money-Makers

Fig. 7* shows another large machine, using the Modern Mechanical Drive. These gears are of the spiral bevel type, which is the immediate predecessor of the hypoid gear shown in the other pictures. This machine also has the gears on the drier section, instead of silent chain. This machine is one of the largest money-makers in the country, their top days running as high as 400 tons of kraft. The width of the paper is 234 inches, and the speed 1,000 feet per minute.

* Picture referred to not published in this article.

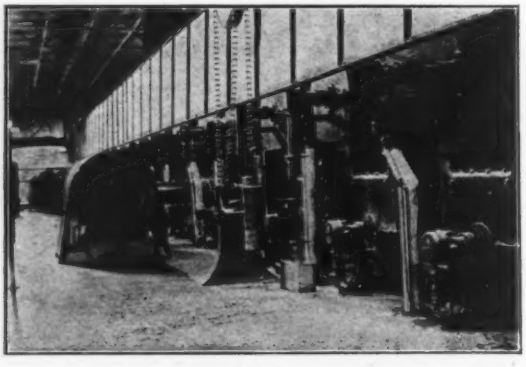


FIG. 5.
The drier drives.

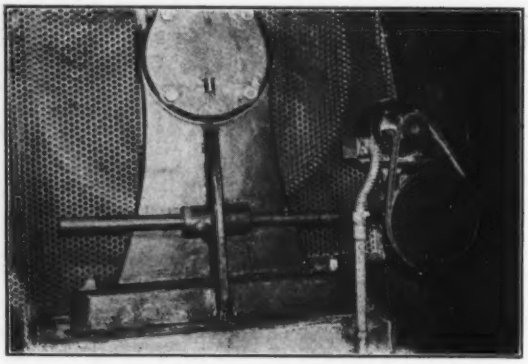


FIG. 6.
Details of drier drive, showing electric remote-controlled belt shifter.

The same company owns the mill illustrated in Fig. 8*. This is a 220-inch kraft machine, the speed of which is being stepped up to 1,200 feet per minute. This mill also is a notable money-maker, being one of the richest companies in the paper industry. The tremendous production at low operating cost, because of the low investment cost and low maintenance cost which the Modern Mechanical Drive permits them to enjoy, is partly responsible for the success of this paper mill, and is so profitable to this company that their new mill, being built 500 miles farther up along the same cost, is being built with precisely this same type of Modern Mechanical Drive. All of these mills and the new mill being built are equipped with modern 3-ply leather belts for high-speed, continuous operation and high production at low belt cost, and the elimination of machine shutdowns chargeable to belt. All the maintenance on these belts is done during shutdowns for other purposes.

I hope that my words and these pictures have left some new thoughts with you, and I hope that when you are modernizing your old mill or when you are building new machines, you will take advantage of the low cost, high-speed operation made possible by the simplicity, sturdiness, and reliability of these machines, as is being done in the newest mills all over the country, and will avail yourself of the extra profit which this modern, highly-developed equipment will provide you with as some of the biggest and most successful paper companies in the country are doing today, and that you will take advantage of the economical, trouble-free operation with which this modern equipment will provide you.

Swedish Pulp Industry Busy

[FROM OUR REGULAR CORRESPONDENT]

WASHINGTON, D. C., June 28, 1937—The Swedish pulp industry continued busily engaged during the early months of the current year, with production and exports at record high levels. Recent sales have been for delivery in 1938. There has been a tendency to avoid commitments later than that year although some 1939 contracts have been reported. One new feature of the advance sale situation has been the growing insistence by sellers on the inclusion of a "war clause" in contracts for future delivery, to protect against contingencies such as higher freight rates and increased production costs.

Application of Gear Motors and Speed Reducers In the Paper Industry*

By R. S. Marthens[1]

In the past ten to fifteen years there has been a very rapid change in the type of drive used in the pulp and paper industry. The advancement of the art has necessitated a great deal of development in connection with the type of drive. Practically all installations have now been electrified and the installation of the relatively high speed prime mover has made necessary a detailed consideration of speed reduction, since motor speeds in many instances are considerably higher than those required for the various applications. Modern trends have been toward even higher motor speeds because of the lighter weight and lower initial cost. High speed motors also cost less to operate due to their greater efficiency and higher power factor.

A general survey of industrial applications indicates that approximately 80 per cent of all motors are connected to the driven machines through some form of speed reduction. In this presentation, an attempt has been made to analyze the applications which are peculiar to the pulp and paper industry and to make recommendations regarding the application of motors to the various operations where speed reduction is required. In general, it may be stated that there are four common ways to reduce speed between parallel shafts: belts, open gears, chains and enclosed geared speed reducers. The advantages of enclosed geared speed reducers are stated as follows:

(1) Reduction in space requirements due to the compactness of the speed reducer unit.
(2) Practical elimination of maintenance costs.
(3) Reliability and durability since, once installed, a speed reducer unit will usually last as long as the machine to which it is connected.
(4) Safety is promoted, due to the fact that the gears are totally enclosed.
(5) Quiet operation is assured with accurately cut gears running in oil.
(6) High mechanical efficiency is obtained, since gears running in oil and usually mounted on anti-friction bearings show very low losses even for relatively high reductions.
(7) The speed reducer unit is impervious to dust and moisture because of its total enclosure.
(8) Synchronized operation between different parts of the same machine or adjacent machines, but at different speeds, can be obtained, since there is no slipping between the gears.
(9) Speed reducer units present a very neat appearance as compared with other types of mechanical drive.

Table I is a tabulation of the various applications found in the preparation of wood pulp and here recommendations are made as to the type of drive which is considered most satisfactory. A number of the applications are considered to be best handled by electric motors directly coupled to the driven equipment. In other applications it is considered advisable to analyze each individual case, since enclosed speed reducer units will, in many cases, show savings in space and initial cost. These applications are classified as gearing possibilities. Still other applications are considered as definite gearing applications, and these have been so indicated.

TABLE I.—PREPARATION OF WOOD PULP

	Motor Only	Gearing Possibilities	Definite Gearing Applications
Wood Room			
Barkers {Tumble Drum	..	X	..
Barkers {Disc	..	X	..
Chippers	X	..	..
Chip Screens	..	X	..
Conveyors	..	..	X
Grinder Room			
Pulp Grinder	X	..	..
Wet Screens	..	X	..
Wet Machine	..	X	..
Thickeners	..	X	..
Save-All	..	..	X
Conveyors	..	..	X
Plunger Pump	..	X	..
Centrifugal Pumps	X	..	..
Wet Screening Room			
Knotters	..	X	..
Pine Screens	..	X	..
Thickeners	..	X	..
Stock Pumps	..	X	..
Chest Agitators	..	..	X
Bleaching Department			
Bleacher	..	..	X
Thickeners	..	X	..
Washers	..	X	..
Beater Room			
Beaters	..	X	..
Chest Agitators	..	..	X
Stock Pump	..	X	..
Jordan	X	X	..

Table II is a similar tabulation covering the various applications for the paper machines.

TABLE II.—PREPARATION OF PAPER

	Motor Only	Gearing Possibilities	Definite Gearing Applications
Machine Room			
Paper Machine {Cylinder	..	..	X
Paper Machine {Fourdrinier	..	..	X
(All Sectional Main Drives)			
Paper Machine {Cylinder	..	X	..
Paper Machine {Fourdrinier	..	X	..
(Mechanical Drive)			
Cylinder Paper Machine (Wet End Auxiliaries)	..	..	X
Paper Machine Auxiliaries			
Broke Conveyor	..	..	X
Fourdrinier Lift	..	..	X
Felt Stretchers	..	..	X
Calender Roll Lift	..	..	X
Finishing Room			
Super Calender	..	..	X
Winders	..	..	X
Rotary Cutters	..	X	..
Trimmers	..	X	..
Platers	..	X	..
Pasters	..	X	..
Corrugators	..	X	..
Conveyors	..	..	X

The most recent in enclosed geared speed reducers is the gearmotor. The development of the gearmotor dates back to approximately 1926, but it was not until a few years ago that manufacturers listed this apparatus as standard and made general application of the same. Today, practically all gear manufacturers and motor manufacturers list in their catalogues and price forms a varied line of gearmotors, from fractional horsepower sizes up to approximately 75 horsepower for both parallel shaft drives and right angle drives. Units are also available for both horizontal and vertical operations. A large variety of motor designs are available and the user of this equipment can generally find a standard piece of apparatus for the majority of applications.

* Presented at the annual convention of the American Pulp and Paper Mill Superintendents Association, Springfield, Mass., June 23-25, 1937.

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Gearmotors may be considered as slow speed motors and, although the majority of gearmotors use 1750 r.p.m. motor parts, the slower speed motor parts can be used. The effect of using the slower speed motor parts is equivalent to increasing the ratio in the gearing parts. It has been found highly desirable to use a preferred series of output speeds for gearmotors, as this enables the manufacturers to list uniform percentage steps and enables the customer to select from the catalogue, a standard speed which is very close to the speed required. Table III shows a table of twenty series of preferred numbers, in which each succeeding step is an increase of 12 per cent.

TABLE III.—DECIMAL PREFERRED NUMBERS
20 SERIES (12 PER CENT)

1.12	11.2	112
1.25	12.5	125
1.40	14.0	140
1.60	16.0	160
1.80	18.0	180
2.00	20.0	200
2.25	22.5	
2.50	25.0	
2.80	28.0	
3.20	32.0	
3.60	36.0	
4.00	40.0	
4.50	45.0	
5.00	50.0	
5.60	56.0	
6.40	64.0	
7.20	72.0	
8.00	80.0	
9.00	90.0	
10.00	100.0	

The preferred series of numbers is receiving a great deal of consideration on the part of machine designers, as well as the American Standards Association and other similar associations.

Several types of gearing are being used by gearmotor manufacturers at the present time, such as spur, single helical and double helical, together with planetary and non-planetary designs. For right angle drives, worm gears, straight or spiral bevels and hypoids may be used.

A great deal of thought has been given on the part of gearmotor designers to the type of construction to be used for the gear case and the necessary adapter, to enable the manufacturer to use standard motor frames which are brought through the shop in high production quantities and which conform in all respects to N.E.M.A. standard mounting dimensions, where the supporting feet are located on the motor frame casting. The problem of deciding upon the proper construction of the gear case includes a consideration of the following:

(1) Ease of assembly and dismantling.
(2) Ease of changing the gear ratio, either in the factory or in the field.
(3) Adequate support for the delivered torque.

To obtain maximum gear ratios in a minimum space, close attention has been paid by the manufacturer to not only the type of gearing and design of the gear case, but also to the material used in the gears themselves. Full advantage is being taken of the developments in metallurgy and heat treatments of gears and shafts. Progress in the art of gear cutting and heat treating has increased considerably the efficiency of gear reduction units, together with a reduction in space requirements. The modern gearing parts used in connection with gearmotors generally show an efficiency of approximately 96 to 98 per cent for the single reduction units and 94 to 96 per cent for the double reduction type.

Anti-friction bearings have also played an important part in the development of gearmotors. By use of such bearings, design of the gear case is simplified and strengthened, giving a more compact and at the same time a more rigid unit. The starting efficiency of anti-friction bearings is generally conceded to be very much higher than that of sleeve bearings. Practically all gearmotor manufacturers have adopted anti-friction bearings in their gearmotor designs.

Lubrication is a relatively simple problem in gearmotors, since the same oil can be used for both the gears and the bearings. One manufacturer of anti-friction bearings recently stated that if the oil is good enough for the gears, it is satisfactory for the bearings. A great deal of thought has been given to the proper selection of lubricant for both the gears and the bearings.

By working together with the lubricant manufacturers, it has been possible to develop some very definite recommendations as to the proper grades of oil to be used over a wide field of operating temperatures and other conditions, and lubrication leaflets are available from either the gearmotor manufacturer or the lubricant manufacturer, covering the lubrication recommendations and other maintenance items. Gearmotor manufacturers have generally adopted the following features in connection with their designs:

(1) A breather and filler plug.
(2) An oil level indicator and plug.
(3) A drain plug to be located at the low point in the gear case.
(4) A plate containing the manufacturer's recommendations as to capacity and grade of oil to be used in the gearing parts.

Various types of oil seals are in common use in gearmotor designs and a great deal of thought has been given to the proper sealing of the connection between the gear case and the motor parts. In practically all gearmotors, the high speed pinion is mounted adjacent to an anti-friction bearing and an oil seal is located between this bearing and the motor parts. It is necessary that none of the oil used in the gear case shall be permitted to leak through into the motor parts. Manufacturers have run tests over long periods of time to determine a type of oil seal which will be satisfactory.

The question has been raised from time to time as to the ultimate field of speed reduction to be covered by gearmotor designs. From the mechanical engineer's viewpoint, there are practically no limits in horsepower rating and the increase in use of gearmotors on many applications indicates that advantages which have been obtained in sizes up to 75 per cent horsepower can also be obtained in much larger units.

Manufacturers of gearmotors have given a great deal of thought to manufacturing methods which will obtain accuracy, since this has considerable bearing on the quietness of operation and life of the equipment. Many troubles previously encountered due to inaccurate gear cutting, faulty alignment, etc., have been eliminated by the use of better machining methods, and anti-friction bearings, which assure constant alignment.

Mr. Marthens' paper was closed with the presentation of many specific instances of the application of gearmotors and speed reducers in the paper industry, together with illustrations of these particular applications.

To Build Paper Mill in Egypt

WASHINGTON, D. C., June 28, 1937—A company was formed in Egypt a few years ago for the establishment of a paper mill, but the matter was left in abeyance after every preparation had been made for the construction of the factory, according to a report from Commercial Attache James T. Scott at Cairo. From recent reports, however, it appears that the establishment of this mill in certain. A company has been formed with a capital of $1,500,000. The promoter of the scheme is H. E. Hassan Nachaat Pasha, Egyptian Minister in Berlin, who has been appointed president of the board.

Cost Engineering*

By J. P. Hagénauer[1]

The paper industry like any other of the large industries of our country has in the last 25 years passed through various cycles of development. Expansion in productivity has been followed by a reduction in output and it in turn by a swing towards higher levels.

Each of these cycles has created new and unforeseen problems to be met by management, and each in turn has been met and solved by using the best of the management tools available at the time.

We have seen the day when the cost men claimed to have solved the problem, or the management engineer, or the technical men. When the sound and the fury had abated the practical man remained, and was left to produce enough good paper to pay for it all and management began to look anew for better methods of control.

No individual, no class, or group alone has the right answer, the solution lies in the combination of all and in sincere whole hearted cooperation, not only of the individuals in one mill, not only of a group of mills of like products or of similar interest, but in the concentrated effort of all mills in the industry, as the action of one mill indirectly affects the whole industry.

Today in our industry the time is past when one man could step into a mill and in a few short weeks show tremendous savings. The day of high prices with resulting high profits is gone, I believe forever.

Through technical advancement and improvement in process and methods the cost of the product has been lowered. Through lower cost increased uses have been encouraged, new markets and products have been developed.

The industry has reached a period in its development when increased profits can only be realized through increased efficiency of operation. To measure the efficiency of a mill, comparison with past performance of the same mill is not sufficient. To compete and be successful today a mill must know its position in relation to others with which it competes and also with the entire industry. Wide awake managements have been on the look out for such information.

Today as in the past accountant meets with accountant, technical men with technical men, operator with operator. Through their discussions tremendous forward strides have been made. But at no time in the past has an attempt been made to combine the results of these efforts into a whole for comparison.

About two years ago the executive committee of the American Paper and Pulp Association, realizing the importance of this problem to the entire industry, commissioned the association staff, to investigate, analyze, and if possible to recommend a solution. The staff believes today that it has found the beginnings of the solution, i.e. a tool of comparative measurement that management wants.

The results are still crude and in the rough. The number of companies participating is small but steadily growing. The results, however, while not perfect or complete clearly indicate that a final solution can be found which can and will be of benefit to the entire industry. The wider the participation the better and more accurate the results.

The problem consists in finding a combination of facts relating to production, operating efficiencies, and conversion costs, which will permit comparison between mills of:

1., the conversion of wood to pulp

2., the conversion of pulp to paper

3., the conversion of paper to the finished product as delivered to the customer. Naturally, all comparisons must contain certain statistical information to properly interpret the results and must cover certain auxiliary departments such as steam and power plants. It was realized early that without analysis of furnish losses the picture would not be complete.

The solution has been sought in a practical way through actual mill contacts and discussions.

Heretofore we have presented the picture and the problem to the accountant and the technical man. Before coming to you today we have consulted with several members of your association individually who felt that our efforts were directed in the right direction.

When management adopts this tool, and we have reasons to think that it will, it will naturally look to you who are actually operating their mills and producing the salable product to measure up favorably with the facts that have been established.

The cost engineering staff of the association solicits your advice, guidance, and criticism. It will be glad to contact any or all of you at your mills for more detailed discussions. Its services are available to any mill or company in our industry regardless of whether they are members of the association or not.

* Presented at the annual convention of the American Pulp and Paper Mill Superintendents Association, Springfield, Mas., June 20-25, 1937.

[1] American Paper and Pulp Association.

Erratum to "Instrumentation Studies X"

Paper Trade Journal 104, No. 15:30 (April 1, 1937)

In the theory of the electrical capacitance method, Section 1F in the above paper, proper account was not taken of the air film between the test sample and metal plate. Taking the air film into account, a new theory has been developed, the result of which is that $(d\text{-}d') = (A/4\pi)(C'\text{-}C)/C'C$. The formula has been shown to give with good accuracy the weighted mean distance between the surface of the test sample and a true plane (the detailed theory will be furnished on request to those interested). The new formula, in addition to being fundamentally correct, combines two advantages over the old formula: (a) smoothness is expressed in terms of a distance rather than in arbitrary units, and (b) smoothness is made independent of caliper. Using the original data, values of the new quantity $(A/4\pi)(C'\text{-}C)/C'C$ have been computed, and are given in the following table. Where no correlation existed before, fair correlation now exists between the instrument rankings. The correlation coefficients of ranking are: New capacitance method vs. Bekk, 0.66; New capacitance method vs. Gurley, 0.77; Gurley vs. Bekk, 0.75.

Sample Number	(d-d') in inches* By Electrical Capacitance Method	Bekk	Gurley	Visual Observers 1 & 2	Visual Observers 3	Visual Observers 4
114F	0.000543 (1)	70 (2)	653 (4)	4	3	4
119F	0.000548 (2)	66 (3)	856 (1)	3	5	3
103W	0.000574 (3)	47 (4)	686 (3)	1	1	1
104W	0.000595 (4)	44 (5)	742 (2)	6	6	5
109F	0.000618 (5)	38 (7)	464 (9)	7	4	7
101W	0.000620 (6)	36 (8)	497 (7)	10	8	8
100W	0.000622 (7)	77 (1)	612 (5)	2	2	2
106F	0.000625 (8)	22 (11)	369 (10)	9	11	9
108W	0.000625 (9)	34 (9)	512 (6)	5	7	6
115F	0.000662 (10)	42 (6)	468 (8)	8	10	10
110F	0.000707 (11)	27 (10)	232 (11)	11	9	11

* If, in the above formula for $(d\text{-}d')$, A is expressed in cm.^{2}, and C and C' in electrostatic units, $(d\text{-}d')$ will be in centimeters.

Pulp and Paper Industry Literature Review

Abstracts of Articles and Patents Compiled by the Abstracts and Bibliography Committee of the Technical Association of the Pulp and Paper Industry, A. Papineau-Couture, John F. Ohlson, C. E. Peterson and Clarence J. West, Chairman

Copies of United States Patents can be obtained from the United States Patent Office, Washington, D. C., for 10 cents each. Send currency, not stamps.

Water

Current Water Supply Problems of the Pulp and Paper Industry. N. Claes H. Fischerstrom. Svensk Pappers-Tidn. 39, Special No.: 119-120, 125-126, 129-132, 135-137 (Sept. 7-8, 1936).—The author discusses the different installations required in the modern pulp and paper mill for providing a sufficient and adequate water supply, such as intake, pumps, conduits, screens, filters, sedimentation basins, etc., with special reference to the natural characteristics of the water available.—C.J.W.

Foam Formation in the Waste Water of Pulp Mills. Finnish Paper and Timber J. 18, no. 19: 938, 940 (Oct. 15, 1936).—The article is essentially an abstract of a Russian article by Edemskaja and Wladimirev, and deals with studies undertaken at the pulp mill at Sjas. The following conclusions were drawn: the foam forming agents are substances which decrease the surface tension of the foaming liquid and increase its viscosity; foaming seems not to be influenced by the height of fall of the discharged water, but, on the other hand, is greatly affected by the quantity of air drawn in from the upper end of the discharge pipe; the method of discharge influences foam formation to a certain extent, the main factor again being the suction of air into the discharge pipe. In the case of waste water from bleaching plants, the nature of the bleach liquor (whether turbid or clear), but not its chlorine content, was found to influence the foaming tendency; chemical preventives, such as kerosene, were successful, but too expensive for use on a large scale.—C. J. W.

White Water. Effect of pH Value and Constituents on the Paper Sizing Quality. H. Imai and F. Ishikawa. Res. Bull. Govt. Printing Bur., Tokyo, 1936, No. 2:1-17; B. C. A. 1936B:1086.—The pH of the white water decreases with an increase in the number of times it is re-used for sizing, and with an increase in the pitch content of the pulp; about 98% of the rosin is retained in the pulp on the machine wire. The degree of sizing of the paper is usually poorer when white water is used to prepare the size, but may be recovered preferably by neutralization with sodium hydroxides or milk of lime, and then shows no diminution, even after the white water has been re-used four times. Addition of water or extra rosin is less effective and the latter hinders formation on the wire.—C.J.W.

Treatment of Sulphite Process Paper Mill White Water. John D. Rue, assignor to Hooker Electrochemical Co. U. S. pat. 2,057,059 (Oct. 13, 1936).—Paper mill white water is treated with milk of lime to produce a pH of not less than 6 and preferably between 7 and 8. The treated white water may be filtered and returned to the process (for washing or diluting the pulp) at any stage ahead of the bleaching step; or it may be used without filtration at any stage immediately following the bleaching process.—A.P.-C.

Sterilization of Pulp and White Water. Clark T. Henderson, assignor to Wallace and Tierman Co., Inc. U. S. pat. 2,061,031 (Nov. 17, 1936).—Chlorine and water are passed into contact with calcium carbonate; the resultant hypochlorous acid solution is mixed with ammonia to produce a solution of chloramine, which is mixed with the water used in making paper stock—A.P.-C.

Mills

High-Grade Paper Making in Canada. Pulp Paper Mag. Can. 37: 681-686 (Nov., 1936).—A brief description of the St. Jerome and Mont Rolland, Que., mills of Rolland Paper Co.—A.P.-C.

New Weyerhauser Unbleached Sulphite Mill at Everett, Wash., is Model of Efficiency. Paper Trade J. 103, No. 18: 108-118 (Oct. 29, 1936).—A description of the mill and its equipment.—A.P.-C.

First Unit of Union Bag and Paper Corporation's New Kraft Plant at Savannah in Operation. D. G. Moon. Paper Trade J. 103, No. 18: 47-76 (Oct. 29, 1936).—A description of the plant and its equipment.—A.P.-C.

Union Bag Builds On Site of Old Plantation. Harry E. Weston, Paper Industry 18: 639-651 (Nov., 1936).—A description of the new sulphate pulp and paper mill of Union Bag and Paper Co. at Savannah, Ga.—A.P.-C.

Air, a Raw Material to Which Gradually More Attention is Being Paid in the Pulp and Paper Industry. Harald A. Erikson. Svensk Pappers-Tidn. 39, Special No.: 138, 141-144, 147-150 (Sept. 7-8, 1936).—The article describes briefly the significance and importance of air conditioning in the pulp and paper industry with regard to human well-being, working conditions, and efficiency, as well as its influence upon the goods produced. Reference is made to the relationship existing between the drying process and air conditioning, certain drying and heat recovery systems, ventilation problems of the paper machine room, and the economic factors involved.—C.J.W.

The Central Research Laboratory at Helsingfors. Svensk Pappers-Tidn. 39, Special No.: 45-46, 49-50, 55 (Sept. 7-8, 1936).—An illustrated description is given of the development and installations of the Central Laboratory of the pulp and paper industry in Helsingfors, Finland. It started from modest beginnings in November, 1916, in affiliation with the "Abo Akademi"; the enterprise was so successful that a separate building was erected in Helsingfors and occupied at the beginning of 1925. The laboratory comprises five departments, e.g., 1) general, 2) chemical pulp control, 3) mechanical pulp control, 4) experimental pulping, and 5) a botanical-biological section. On the average, twenty-seven university-trained assistants are employed, G. K. Bergman having been the director of the institution since 1919—C.J.W.

The Fight Against Bacteria and the Part Which Wall Papers Will be Called Upon to Play. Jacques Risler. Mon. Papeterie Belge 16: 454-455 (July-Aug., 1936).—It is suggested that suitable antiseptic agents of low volatility together with fixing agents be incorporated in the composition of wall papers; this could ensure destruction of bacteria over a period of several years.—A.P.-C.

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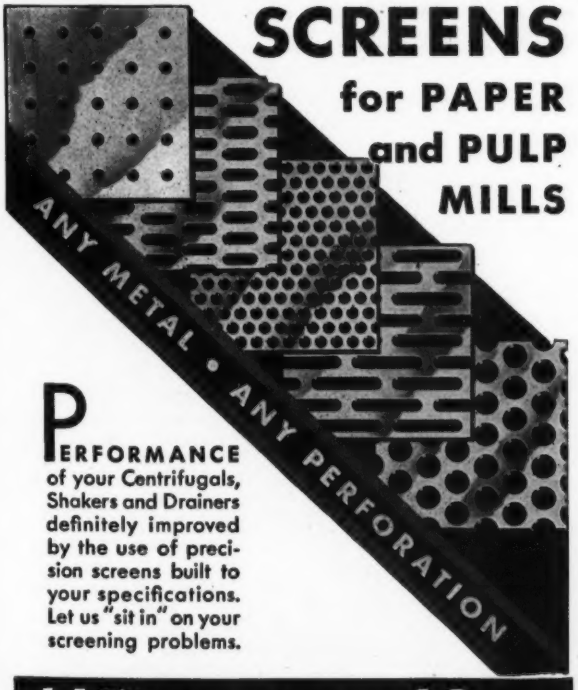

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SUMMARY

Cigarette paper ..... 1457 cs.
Wall paper ..... 18 cs.
Paper hangings ..... 9 bls., 1 cs.
Newsprint ..... 3,981 rolls
Printing paper ..... 91 rolls, 88 cs.
Wrapping paper ..... 266 rolls, 2 cs.
Filter compound ..... 20 bls., 40 cs.
Filter paper ..... 8 bls., 13 cs.
Drawing paper ..... 10 cs.
Metal coated paper ..... 29 cs.
Surface coated paper ..... 56 crates, 84 cs.
Baryta coated paper ..... 21 cs.
Basic paper .....6 crates, 5 cs.
Coated paper ..... 2 cs.
Decalcomania paper .....24 cs. (duplex)
Decalcomanias ..... 7 cs.
Tissue paper ..... 1 cs.
Transfer paper ..... 14 cs.
Paper tubes ..... 236 ctns., 49 cs.
Paste board ..... 14 cs.
Note books ..... 5 cs.
Miscellaneous paper ..... 175 bls., 480 rolls, 17 cs.

CIGARETTE PAPER

Saurez & Crespo, *Collamer,* St. Nazaire, 2 cs.
American Tobacco Co., *Collamer,* Bordeaux, 193 cs.
Champagne Paper Co., *Collamer,* Bordeaux, 467 cs.
De Mauduit Paper Corp., *Paris,* Havre, 2 cs.
Champagne Paper Corp., *Paris,* Havre, 421 cs.
Globe Shipping Co., *Excalibur,* Marseilles, 3 cs.
R. J. Reynolds Tobacco Co., *Washington,* Havre, 194 cs.
De Mauduit Paper Corp., *Washington,* Havre, 175 cs.

WALL PAPER

Rohner Gehrig & Co., *Stavangerfjord,* Hagastrom, 4 cs.
———, *Columbus.* Bremen, 3 cs.
———, *Washington,* Havre, 8 cs.
———, *Amagisan Maru,* Yokohama, 3.

PAPER HANGINGS

W. H. S. Lloyd & Co., *Brittanic,* Liverpool, 9 bls., 1 cs.

NEWSPRINT

Jay Madden Corp., *Berlin,* Bremen, 521 rolls.
———, *Stavangerfjord,* Skien, 254 rolls.
———, *Stavangerfjord,* Oslo, 205 rolls.
Jay Madden Corp., *Columbus,* Bremen, 529 rolls.
N. Y. Post, *Elg,* Port Alfred, 1664 rolls.
Perkins Goodwin & Co., *New York,* Hamburg, 199 rolls.
H. G. Craig Co., *Kermic,* Donnacona, 305 rolls.
International Paper Co., *International No. 1,* Gatineau, 304 rolls.

PRINTING PAPER

Lansen Naeve Corp., *Volendam,* Rotterdam, 12 cs.
Oxford University Press, *Franconia,* Liverpool, 3 cs.
Steiner Paper Corp., *Columbus,* Bremen, 3 cs.
Dingelstedt & Co., *Columbus,* Bremen, 67 cs.
Parsons & Whittemore, Inc., *Washington,* Hamburg, 91 rolls.
E. Dietzgen & Co., *New York,* Hamburg, 3 cs.

WRAPPING PAPER

Phoenix Shipping Co., *Berlin,* Bremen, 2 cs.
Jay Madden Corp., *Washington,* Hamburg, 266 rolls.

FILTER COMPOUND

H. Reifenberg, *New York,* Hamburg, 40 cs., 20 bls.

FILTER PAPER

C. Schleicher & Schull Co., *New York,* Hamburg, 8 bls.
H. Reeve Angel & Co., Inc., *American Merchant,* London, 13 cs.

DRAWING PAPER

H. Reeve Angel & Co., Inc., *American Merchant,* London, 8 cs.
Japan Paper Co., *American Merchant,* London, 2 cs.

METAL COATED PAPER

K. Pauli Co., *Berlin,* Bremen, 17 cs.
K. Pauli Co., *Columbus,* Bremen, 12 cs.

SURFACE COATED PAPER

Gevaert Co. of America, *Westernland,* Antwerp, 79 cs.
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Globe Shipping Co., *New York,* Hamburg, 5 cs., 6 crates.

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B. F. Drakenfeld & Co., *Franconia,* Liverpool, 1 cs.

TRANSFER PAPER

D. C. Andrews & Co., *New York,* Hamburg, 4 cs.
Phoenix Shipping Co., *New York,* Hamburg, 10 cs.

PAPER TUBES

———, *Columbus,* Bremen, 236 ctns., 49 cs.

PASTE BOARD

———, *Columbus,* Bremen, 14 cs.

NOTE BOOKS

E. Dietzgen & Co., *New York,* Hamburg, 5 cs.

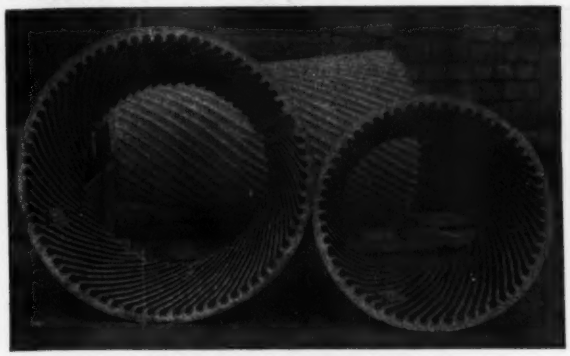
MISCELLANEOUS PAPER

———, *Stavangerfjord,* Oslo, 175 bls., 480 rolls.
Coty Processing Co., *Paris,* Havre, 6 cs.
Keller Dorian Paper Co., *Excalibur,* Marseilles, 7 cs.
H Reeve Angel & Co., Inc., *Bordeaux Maru,* Yokohama, 4 cs.

RAGS, BAGGINGS, ETC.

Hughes Fawcett, Inc., *Kiyosumi Maru,* Kobe, 37 bls. flax waste.
Williamson Products Co., *Kiyosumi Maru,* Kobe, 250 bls. cotton waste.
Linter Supply Co., *Kiyosumi Maru,* Kobe, 200 bls. cotton waste.
E. J. Keller Co., Inc., *Kiyosumi Maru,* ———, 100 bls. paper stock.
J. F. Keene, *Collamer,* St. Nazaire, 25 bls. rags.
J. F. Keene, *Collamer,* Bordeaux, 104 bls. rags.
Banco Coml. Italiane Trust Co., *Caledonia,* Glasgow, 38 bls. old strings.
———, *Franconia,* Liverpool, 45 bls. rags.
Philadelphia National Bank, *Westernland,* Antwerp, 120 bls. rags.
———, *Westernland,* Antwerp, 166 bls. flax waste.
Keene, Inc., *Cold Harbor,* Manchester, 33 bls. new cuttings.
Irving Trust Co., *Cold Harbor,* Liverpool, 273 bags picker waste.

REG. U.S. PAT. OFFICE "POSITIVE" TRADE MARK



Spiral Type Jordan Fillings

THE BAHR BROS. MFG. CO.

OUR SPECIALTY IS JORDAN FILLINGS

SPIRAL TYPE JORDAN FILLINGS
TWIN SPIRAL BAR JORDAN FILLINGS
THE OLD TYPE BAR JORDAN FILLINGS

Jordan fillings for every kind of stock, and for every known trade name and size Jordan. The bars, made of our stainless metal, resist the action of chemicals; also plain to meet the requirement in rough stock mills.

Place your refining problem up to us. Our high speed refiners are built for belt or V-belt drive; also for direct connected.

Your inquiries will have our prompt attention.

MARION, INDIANA, U. S. A.

PHENO

Bright Green

Pheno Bright Green is an economical bright shade of Direct Green. It finds extensive use in the production of "Moss Green" blotting. It is also used as a base color to produce deep shades of green in cover, wrapping and tissue papers. Ask for a sample today.

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A DIVISION OF AMERICAN CYANAMID COMPANY
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The ORIGINAL self-dispersing Pigment Blues for tinting:

NYCO

LIQUID BLUES
and
SUPER BLUES (Dry)

OUTSTANDING—but only one series of the NYCO complete line of selected colors for the Paper Manufacturer.

● Consult NYCO when you have a color problem ● Our laboratory facilities are at your disposal ●

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REDWOOD PIPE LASTS LONG AND SAVES MONEY

it has 14% greater carrying capacity than metal pipe. Resists Frost where severe winters raise havoc with metal pipe. Does not fill up with vegetable matter nor corrode; does not Scale or Pit; is immune to Electrolysis; weighs about 1/3 as much as metal pipe and more easily installed. Wyckoff Redwood Pipe, made of all Clear Heart Stock Redwood Lumber, made in sizes of one inch and up, maximum lengths 12 feet, for pressure to 172 pounds, is used extensively for Water Supply Lines, Penstocks, Sewage Lines, Chemicals, Paper Mills, Tanneries, Fisheries, Mines, and Fume Stacks. We can furnish selected Canadian White Pine or Oregon Fir Wood Pipe if specified. We also manufacture underground Wooden Steam Pipe Covering. Carload shipments can be made one day after receipt order.

A. WYCKOFF & SON COMPANY *Office and Factory,* **65 Home Street, ELMIRA, N. Y.**
The Originators of Machine Made Wood Pipe ***Our 82nd Anniversary***

Castle & Overton, Inc., *Excalibur,* Alexandria, 75 bls. bagging, 127 bls. rags.
R. J. Ross & Co., Inc., *Excalibur,* Alexandria, 309 bls. rags, 277 bls. bagging.
R. Blank, *Excalibur.* Alexandria, 159 bls. old cottons, 114 bls. bagging.
———, *Excalibur,* Alexandria, 61 bls. rags.
E. J. Keller Co., Inc., *Excalibur,* Alexandria, 410 bls. rags, 247 bls. bagging.
E. J. Keller Co., Inc., *Northern Prince,* ———, 34 bls. paper stock.
Chase National Bank, *Chelyuskinets,* Odessa, 225 bls. rags.
Mitsui & Co., Ltd., *Amagisan Maru,* Kobe, 350 bls. cotton waste.
Fleming Joffe, *Voroshilov,* Leningrad, 595 bls. flax waste.
Chase National Bank, *Voroshilov,* Leningrad, 6273 bls. paper stock.
———, *Voroshilov,* Leningrad, 60 bls. rags.
Banco Coml. Italiane Trust Co., *New York,* Hamburg, 257 bls. rags.
C. Feller, *Oriente,* Havana, 66 bls. rags.
Michigan Felt Works, *Bordeaux Maru,* Shanghai, 150 bls. picker waste.
Boger Cotton Products Co., *Bordeaux Maru,* Shanghai, 150 bls. cotton waste.
———, *Bordeaux Maru,* Kobe, 900 bls. cotton waste.
Royal Manfg. Co., *Bordeaux Maru,* Kobe, 17 bls. rags.
E. J. Keller Co., Inc., *Kiyosumi Maru,* ———, 200 bls. paper stock.
E. J. Keller Co., Inc., *Ida,* ———, 298 bls. paper stock.

OLD ROPE

W. Steck & Co., *Collamer,* Havre, 106 rolls.
Birkenstein & Sons, *Collamer,* Havre, 16 pkgs.
J. Birkenstein Co., *Collamer,* St. Nazaire, 78 pkgs.

CASEIN

National City Bank, *Northern Prince,* Buenos Aires, 751 bags.
American Cyan. & Chemical Corp., *Amapala,* Santiago de Cuba, 105 bags.

WOOD PULP

Bulkley Dunton Pulp Co., Inc., *British Prince,* ———, 2750 bls. sulphite.
Acer McLernon, Ltd., *British Prince,* Port Alice, 190 bls. sulphite.
Chase National Bank, *Stavangerfjord,* Oslo, 600 bls. sulphite.
Irving Trust Co., *Stavangerfjord,* Oslo, 660 bls. mechanical pulp.
The Borregaard Co., Inc., *Stavangerfjord,* Oslo, 1122 bls. sulphite.
A. Giese & Son, *Volendam,* Rotterdam, 40 bls. wood pulp.
Bulkley Dunton Pulp Co., Inc., *Volendam,* Rotterdam, 577 bls. wood pulp.
Castle & Overton, Inc., *New York,* Hamburg, 2160 bls. wood pulp, 423 tons.
M. Sone, *Deutschland,* Hamburg, 412 bls. wood pulp.
M. Sone, *Kungsholm,* Gothenburg, 254 bls. wood pulp.

WOOD PULP PASTE BOARD

Flexideal Dry Mat Co., *Washington,* Hamburg, 72 cases.

NEWARK IMPORTS

WEEK ENDING JUNE 26, 1937

H. G. Craig Co., *Donpaco,* Donnacona, 318 rolls newsprint.

ALBANY IMPORTS

WEEK ENDING JUNE 26, 1937

Price & Pierce, Ltd., *Kentucky,* ———, 2500 bls. bleached sulphite, 1350 bls. unbleached sulphite.

PORTLAND IMPORTS

WEEK ENDING JUNE 26, 1937

Price & Pierce, Ltd., *Schwanheim,* ———, 1350 bls. unbleached sulphate, 300 bls. unbleached sulphite.

BOSTON IMPORTS

WEEK ENDING JUNE 26, 1937

E. J. Keller Co., Inc., *Kiyosumi Maru,* ———, 100 bls. rags.
———, *Cold Harbor,* Liverpool, 21 bls. rags, 5 bls. bagging.
Elliott Addressing Machine Co., *Bordeaux Maru,* Yokohama, 17 cs. paper.
Price & Pierce, Ltd., *Schwanheim,* ———, 600 bls. unbleached sulphate, 1350 bls. unbleached sulphite.

NEW LONDON IMPORTS

WEEK ENDING JUNE 26, 1937

Price & Pierce, Ltd., *Belos,* ———, 6210 bls. unbleached sulphate, 2850 bls. unbleached sulphite.

PHILADELPHIA IMPORTS

WEEK ENDING JUNE 26, 1937

American Express Co., *Black Heron,* Antwerp, 70 bls. paper stock.
W. Steck & Co., *Black Heron,* Antwerp, 109 bls. jute waste.
R. J. Ross & Co., Inc., *Black Heron,* Antwerp, 50 bls. rags.
J. M. Hagy Waste Works, *Black Heron,* Antwerp, 23 bls. rags.
F. Stern, *Black Heron,* Rotterdam, 40 coils old rope.
E. J. Keller Co., Inc., *Black Heron,* ———, 27 bls. rags.
A. L. Diament Co., *Collamer,* Havre, 1 cs. painting paper
Castle & Overton, Inc, *Collamer,* Havre, 31 bls. new cuttings, 56 bls. rags.
W. F. Sherwood & Son, *Collamer,* Havre, 60 bls. rags.
E. J. Keller Co., Inc., *Collamer,* ———, 39 bls. rags.
J. F. Keene, Inc., *Collamer,* Bordeaux, 112 bls. rags.
Union Waste Co., Inc., *Collamer,* Bordeaux, 92 bls. rags.
J. M. Hagy Waste Works, *Amagisan Maru,* Kobe, 107 bls. rags.
J. M. Hagy Waste Works, *Bordeaux Maru,* Kobe, 110 bls. rags.
National Wiping Cloth Co., *Bordeaux Maru,* Kobe, 25 bls. rags.
Union Waste Co., Inc., *Bordeaux Maru,* Kobe, 70 bls. rags.
Philadelphia National Bank, *Bordeaux Maru,* Kobe, 100 bls. cotton waste.
Gottesman & Co., Inc., *Kelkheim,* Sweden, 4200 bls. wood pulp.
Price & Pierce, Ltd., *Hammaren,* ———, 180 bls. bleached sulphite.
Price & Pierce, Ltd., *Kelkheim,* ———, 2100 bls. unbleached sulphite.

BALTIMORE IMPORTS

WEEK ENDING JUNE 26, 1937

Congoleum Nairn Co., *Collamer,* Havre, 1152 bls. rags.
Congoleum Nairn Co., *Collamer,* St. Nazaire, 243 bls. rags.
Congoleum Nairn Co., *Collamer,* Bordeaux, 248 bls. rags.
M. Sone, *Laura C.,* Trieste, 1636 bls. wood pulp.
Bankers Trust Co., *Laura C.,* Trieste, 2595 bls. wood pulp.
Bank of Manhattan Trust Co., *Laura C.,* Trieste, 622 bls. wood pulp.
S. Shapiro & Sons, Inc., *Bordeaux Maru,* Kobe, 330 bls. rags.
M. Sone, *City of Norfolk,* Hamburg, 1089 bls. wood pulp.
Gottesman & Co., Inc., *Boren,* Sweden, 9300 bls. wood pulp.
Price & Pierce, Ltd., *Boren,* ———, 7800 bls. unbleached sulphite.
Price & Pierce, Ltd., *Consul Corfitzon,* ———, 3000 bls. unbleached sulphite, 4800 bls. unbleached mechanical pulp.

NORFOLK IMPORTS

WEEK ENDING JUNE 26, 1937

N. Y. Trust Co., *Collamer,* Havre, 160 bls. bagging.

HOUSTON IMPORTS

WEEK ENDING JUNE 26, 1937

National City Bank, *Bordeaux Maru,* Kobe, 80 bls. bagging.

MONTREAL IMPORTS

WEEK ENDING JUNE 26, 1937

Price & Pierce, Ltd., *Idefjord,* ———, 2156 bls. unbleached sulphite, 4386 bls. unbleached sulphate.

Charles Cashmore Made President

PASSAIC, N. J., June 28, 1937—Charles Cashmore, of Torresdale, Pa., has succeeded the late George L. Leonhard, of Passaic, as president of the Paterson Parchment Paper Company, whose plant at Bristol, Pa., was moved there from Passaic in 1933. Mr. Leonhard had been president of the company for two years. Before that he had been treasurer many years.

Before he was elected president, Mr. Cashmore was treasurer of the company and its assistant director of sales.

WHY NOT

REDUCE YOUR FOURDRINIER WIRE COSTS BY USING A WIRE THAT WILL GIVE YOU ALL AROUND SERVICE.

USE

A WIRE WITH A NON-CRACK PATENTED SELVIDGE

PURVES WIRES

ARE AS GOOD AS THE BEST.

PURVES MACHINE WIRE COMPANY, INC.
HOLYOKE, MASSACHUSETTS

The Name

COES

has been on

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Since 1830

107 Years

Specializing on all types of

Paper Blades

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MICRO GROUND

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Manufacturers of

ENGLISH FINISH SUPERCALENDERED
MACHINE FINISHED BOOK
and LITHOGRAPHIC PAPERS

Offset, Envelope, Bond, Writing, Mimeograph, Ledger, Cover and Music Papers, Index Bristol, Post Card and Label Papers

HIGH GRADE COATED BOOK

. . . .

KRAFT WRAPPING AND KRAFT ENVELOPE.
KRAFT CYLINDER BOARD.
BLEACHED SULPHITE AND SODA PULP.
BLEACHED AND UNBLEACHED KRAFT PULP.

MILLS:

Mechanicsville, New York
Luke, Maryland
Covington, Virginia
Tyrone, Pennsylvania
Williamsburg, Pennsylvania
Cass, West Virginia

Written IN BLOOD AND RED INK

are the casualty records of many paper mills where unprotected floor surfaces contribute largely to the accident toll. In your own experience, you have seen it . . . lost man power and morale, high compensation cost. And, a moment's thought will tell you how great will be the saving, with hazardous areas protected by NEVERSLIP Rolled Steel Floor Plate. This—the "perfect diamond pattern" which affords safe footing (and easy trucking surface) from *every* direction—belongs in your mill, for your protection!

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AMERICAN PRESSED STEEL COMPANY PTJ
Commercial Trust Building, Phila., Pa. 7/1

NAME .....
TITLE .....
COMPANY .....
ADDRESS .....

New York Market Review

Office of the PAPER TRADE JOURNAL,
Wednesday, June 30, 1937.

Although the demand for papers in general has fallen off somewhat during the last few weeks, there is considerable optimism expressed regarding the future of the paper market. From the point of view of some manufacturers of various kinds of fine papers, as well as of manilas, jutes and other grades of coarser paper, the market held up fairly well and is expected to do better. In some quarters of the wholesale market, merchants report that there is more activity than usual at this time, particularly in fine papers. On the whole, there is a good volume of business for this particular time of the year.

The box board market which has been quiet for some time is showing a tendency to improve, although the box board merchants are to shut down during the week of July 4 for their annual vacation.

Old Rope and Bagging

The old rope market continues to manifest a slightly softer tone. Demand for domestic and foreign old manila rope is about regular, but small mixed rope is moving slowly. The bag market also is moving regularly. Demand for domestic and imported gunny and scrap bagging is less active than last week.

Rags

Listlessness prevails in the domestic rag market. The demand for old rags has fallen off slightly and with the exception of old whites is rather irregular. Roofing grades are moderately active.

Waste Paper

The demand for the better grades of paper stock is still holding up and the board grades are fairly firm, with the exception of mixed papers and news, the prices for which showed a further decline over last week.

Mechanical and Chemical Pulp

The situation in the mechanical pulp and chemical pulp markets has shown no particular change during the week from the report outlined in the last issue.

Approved Testing Chemists

The following have been accepted by the Joint Committee on Approved Pulp Testing Chemists for the Paper Industry, as approved pulp and paper mill testing chemists, effective June 23, 1937: Clarence A. Enghouse, Crown Willamette Paper Company, West Linn, Ore.; William Richmond Barber, Crown Willamette Paper Company, Camas, Wash., and James Petrie, Pacific Mills, Ltd., Ocean Falls, N. B.

To Start Box Factory at Buffalo

BUFFALO, N. Y., June 21, 1937—The U. S. Corrugated Fiber Box Company, with main offices in Indianapolis, has leased a plant in 180 Hopkins street, owned by the Arrowhead Piston and Pin Company, of Minneapolis, and will start the manufacture of containers in Buffalo late this month.

The Fibre company, which ranks as one of the largest container manufacturing firms in the country, has plants in Indianapolis, Warwood, W. Va.; Dayton, Ohio, and Knox, Pa. In Buffalo, the company maintains a district sales office at 24 South Geary street, with W. Frank Taylor in charge. The company's customers include Sears, Roebuck & Co. and Montgomery Ward & Co. Howard J. Lacy is president and treasurer.

The plant which has been leased has about 35,000 square feet of floor space and is expected to employ about 200 men when operations are started.

The property was leased through Parke, Hall & Co., realtors. Announcement was made by the Buffalo Real Estate board.

Northern Paper Mills Hold Outing

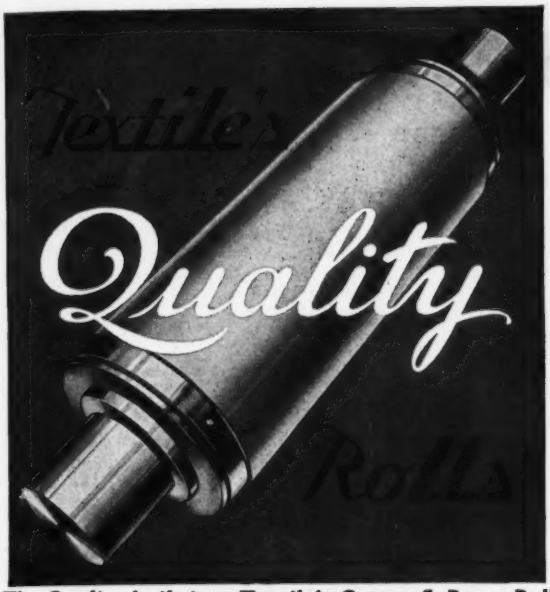
[FROM OUR REGULAR CORRESPONDENT]

APPLETON, Wis., June 21, 1937—The Northern Paper Mills, Green Bay, Wis., closed down Saturday, June 12, so the employees could hold their annual picnic, conducted by the Northern Paper Mills Welfare Safety Club. Approximately 1,800 enjoyed a day of recreation following a street parade through Green Bay and De Pere. Mill officials who addressed the picnickers were W. P. Wagner, president, A. B. Hansen, general manager, Frank Timmerman, mill manager, and H. W. Tuttrup, treasurer. Otto Rachals was reelected president of the club at its annual business meeting.

Not Approved by U. S. Government

[FROM OUR REGULAR CORRESPONDENT]

WASHINGTON, D. C., June 23, 1937—The J. F. Friedel Paper Box Company, Syracuse, N. Y., also trading as J. F. Friedel Company, engaged in the manufacture of paper boxes and kindred items, has entered into a stipulation with the Federal Trade Commission by which it has agreed to discontinue the use in circulars or other advertising matter of representations which, in effect, may tend to cause purchasers to believe that the method of protecting garments against moth damage as used in its Pro Tex Wardrobe has been endorsed or approved by the United States Government or any of its departments, when such is not a fact.



The Quality built into Textile's Cotton & Paper Rolls is founded on more than 70 years experience in the manufacturing of Calenders & Rolls for the Paper Industry.

The Textile-Finishing Machinery Co.
New York Office
50 Church St.
Southern Office
Johnston Bldg., Charlotte, N. C.
Providence, R. I.

SCHOPPER

Leaders of precision, sensitivity, modern design, perfect workmanship for over half a century.

For T.A.P.P.I. and A.S.T.M. Standard Tests.

SCHOPPER TENSILE STRENGTH & STRETCH TESTERS, ELECTRIC DRIVEN WITH VARIABLE SPEED DRIVE, also HYDRAULIC VARIABLE SPEED DRIVE & HAND DRIVE.

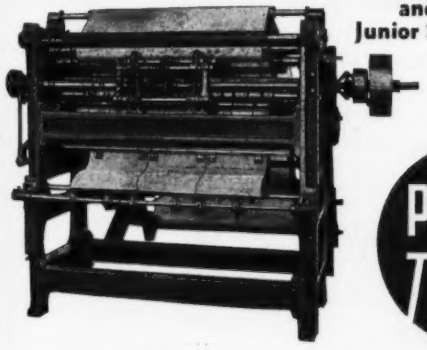
SCHOPPER STANDARD PAPER TESTERS

PAPER SCALES — FREENESS TESTERS — MICROMETERS — EXPANSION TESTERS — BURSTING TESTERS — FOLDING TESTER — RAPID SHEET MAKING MACHINE — JOHNSON FIBRE CLASSIFIER.

TESTING MACHINES, INC.

462 W. 34th St. New York, N. Y.

FOR FOLDING STANDARD SIZE and Junior Sizes



PAPER TOWELS

full rotary-ball bearing interfolder

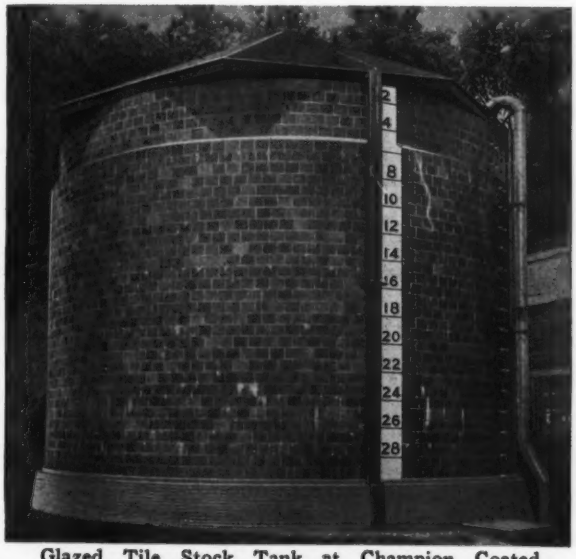
Simply constructed, the upkeep of this machine is next to nothing, although the guaranteed production is 25 cases per hour. Illustrated here is the standard three wide towel interfolder, but this machine can also be built so that it is one, two, three, four or five wide with production of 12 cases for single width up to approximately 40 cases on the five wide machine. Towels are slit to their proper size with a score cut slitter running on a hardened surface roll, which gives the ends a smooth shearlike cut. The cut-off mechanism is a full rotary mechanism making a saw tooth cut.

Complete details upon request.

Paper Converting Machine Co., Green Bay, Wis.

Designers and manufacturers of High Speed Rotary Folders for napkins, towels and toilet paper; Rotary printing presses for napkins, bags, envelopes; Creping Machines, bundling presses and special converting machinery.

Kalamazoo for TANKS



Glazed Tile Stock Tank at Champion Coated Paper Co., Hamilton, Ohio

Kalamazoo Vitrified Glazed Tile Tanks for Jordan chests, stock chests, Fletcher Bleachers, etc., are clean, strong, permanent, and cost less than reinforced concrete. Write for complete information.

KALAMAZOO TANK & SILO CO.
KALAMAZOO, MICHIGAN

Miscellaneous Markets

Office of the PAPER TRADE JOURNAL,
Wednesday, June 30, 1937.

BLANC FIXE—Prices in the blanc fixe market are generally holding to formerly quoted levels. The pulp is quoted at from $42.50 to $45 per ton in bulk; while the powder is selling at from 3½ to 3¾ cents per pound, in barrels, at works.

BLEACHING POWDER—Conditions in the bleaching powder market are improving slightly. The contract movement is normal and prices are generally maintained at former levels. Bleaching powder is offered at from $2 to $2.25 per 100 pounds, in drums, at works.

CASEIN—The casein market rules fairly steady. Domestic standard ground casein is now quoted at from 13 to 14 cents per pound; while domestic finely ground casein is selling at from 13½ to 14½ cents per pound, all in bags, car lot quantities.

CAUSTIC SODA—Trading in the local caustic soda market is fairly satisfactory. Contract shipments are normal. Solid caustic soda is quoted at from $2.55 to $2.60; while the flake and ground are selling at from $2.85 to $3 per 100 pounds, in drums, at works.

CHINA CLAY—The china clay market is experiencing a strong undertone. Contract shipments are moving freely. Imported china clay is quoted at from $15 to $21 per ton, ship side; while domestic paper making clay is selling at from $6.50 to $12 per ton, at works.

CHLORINE—Business in the chlorine market is holding up and the contract movement is about normal. Prices are generally maintained at formerly quoted levels. Chlorine is quoted at from $2.15 to $2.25 per 100 pounds, in tank cars, at works.

ROSIN—The rosin market is somewhat stronger. Paper making gum rosin is now quoted at $8.15 and wood rosin at $8.20 per 280 pounds, gross weight, in barrels, at Savannah. Seventy per cent rosin size is selling at $3.68 per 100 pounds, in tank cars, at works.

SALT CAKE—Demand for salt cake is still persistent. Prices are steady to firm. Salt cake is quoted at from $12 to $13; chrome salt cake at from $11 to $12 per ton, at works; while imported salt cake is selling at from $12 to $13 per ton, ship side.

SODA ASH—The soda ash market is fairly active. Demand from the paper mills is moderately insistent. Prices are well maintained. Quotations on soda ash, in car lots, at works, per 100 pounds, are as follows: in bulk, $1.05; in bags, $1.20; and in barrels, $1.50.

STARCH—Paper mill demand for starch is normal and the contract movement is regular. Prices are now steady and unchanged. Special paper making starch is quoted at $4 per 100 pounds, in bags; and at $4.27 per 100 pounds, in barrels, at works.

SULPHATE OF ALUMINA—The sulphate of alumina market is stronger. Contract shipments are moving in good volume. Commercial grades are quoted at from $1.25 to $1.60; while iron free is selling at from $2 to $2.25 per 100 pounds, in barrels, at works.

SULPHUR—The sulphur market is steady. Yearly contracts are quoted at $18 per long ton on orders of 1,000 tons, or over. On spot and nearby car loads the quotations are $21 per ton. All quotations are in car lots, at works.

TALC—Offerings of talc are moving into consumption in moderate volume. In most instances prices are holding to schedule. Domestic talc is quoted at from $15 to $18 per ton, eastern mines; while imported talc is selling at from $23 to $30 per ton, on dock.

Market Quotations

Paper

Tissues—Per Ream—

White No. 1	1.10	@	—
White No. 1 M. G.	1.07½	@	—
White No. 1½	.77½	@	—
White No. 2	.75	@	—
Anti-Tarnish M. G.	.77½	@	—
Colored	.90	@	—
Kraft	.77½	@	—
Manila	.75	@	—
Unbleached Toilet	2.60	@	3.30
Bleached Toilet	3.94	@	5.26

Paper Towels—

Unbleached	2.10	@	3.35
Bleached	3.30	@	3.70

Manila—

No. 1 Jute	9.00	@	9.25
No. 2 Jute	7.75	@	8.50
No. 1 Wood	4.00	@	5.25
No. 2 Wood	3.50	@	4.00

Fibre Papers—

No. 1 Fibre	4.25	@	5.50
No. 2 Fibre	4.00	@	4.75

(Delivered New York)

News, per ton—

Roll, contract	42.50	@	—
Sheets	47.50	@	—

Kraft—

No. 1 Northern	5.25	@	5.75
Standard	5.00	@	—
Southern	5.00	@	—
Glazed	4.50	@	—
Striped	4.75	@	—

Boards, per ton—

News	47.50	@50.00
Chip	45.00	@47.50
Sgl. Mla. Ll. Chip	55.00	@60.00
Jute Lined Chip	55.00	@60.00
Kraft Liners	65.00	@67.50
White Pat. Coated	67.50	@70.00
Binders Boards	70.00	@75.00

The following are representative of distributors' resale prices:—

Rag Content Bonds and Ledgers—
White, Assorted Items,
Delivered in Zone 1:

	Bonds	Ledgers
100% Rag Ext. No. 1	$41.40@$48.50	$42.55@$50.00
100% Rag	32.80@ 38.50	33.95@ 39.75
85% Rag	.....	32.20@ 37.75
75% Rag	24.75@ 29.00	25.90@ 30.50
65% Rag	21.65@ 26.25	22.80@ 27.75
50% Rag	18.70@ 22.75	19.90@ 24.25
25% Rag	15.80@ 19.25	16.95@ 20.75

Regular Colors @ $1.50 cwt. extra.
Heavy Colors @ $3.00 cwt. extra

Sulphite Bonds and Ledgers—
White, Assorted Items,
Delivered in Zone 1:

	Bonds	Ledgers
No. 1	$9.35@$11.50	$10.55@$12.75
No. 2	8.50@ 10.25	9.65@ 11.75
No. 4	7.60@ 9.25	8.80@ 10.75

Regular Colors @ $1.50 cwt. extra.
Heavy Colors @ $3.00 cwt. extra.

Free Sheet Book Papers—
White, Cased Paper,
Delivered in Zone 1:

No. 1 Glossy Coated	$12.45	@$14.25
No. 2 Glossy Coated	10.80	@ 12.25
No. 3 Glossy Coated	9.65	@ 11.00
No. 4 Glossy Coated	9.05	@ 10.50
No. 1 Antique (watermarked)	9.05	@ 10.50
No. 2 Offset	8.35	@ 9.50
A Grade E. F.	8.20	@ 9.50
A Grade S. & S. C.	8.45	@ 9.75
B Grade E. F.	7.60	@ 8.75
B Grade S. & S. C.	7.85	@ 9.00
C Grade E. F.	7.30	@ 8.50
C Grade S. & S. C.	7.55	@ 8.75
D Grade E. F.	7.00	@ 8.25
D Grade S. & S. C.	7.25	@ 8.50

Ivory & India at $.50 cwt. extra.

No. 3 White Linens	4.50	@	5.00

Mechanical Pulp

(On Dock, Atlantic Ports)

No. 1 Imported—			
Moist	35.00	@	36.00
Dry	40.00	@	42.00

(Delivered)

No. 1 Domestic and Canadian	36.00	@	37.50

Chemical Pulp

(On Dock, Atlantic, Gulf and West Coast Ports)

Bleached Sulphite (Domestic and Foreign)—			
Prime Bleached Sulphite	3.25	@	4.65
Prime Qualities—			
Easy-Bleaching Sulphite	3.50	@	4.00
Strong Unbleached Sulphite	3.40	@	3.65

(On Dock, Atlantic Ports)

Kraft Bleached	4.00	@	4.50
Kraft Light & Strong	3.00	@	3.75
Kraft No. 1	2.90	@	3.65
Kraft No. 2	2.50	@	2.75

(F.o.b. Pulp Mill)

Kraft Domestic	2.75	@	3.25

(Delivered)

Soda Bleached	3.15	@	—

Add 60 cents per short ton, dock charges, for Albany; $2.00 for Lake Ports East and $3.00 for Lake Ports West of Mackinac Straits.

Domestic Rags

New Rags

(Prices to Mill f. o. b. N. Y.)

Shirt Cuttings—			
New White, No. 1	9.00	@	9.25
Silesias, No. 1	6.75	@	7.00
New Unbleached	9.25	@	9.50
Blue Overall	7.50	@	8.00
Fancy	3.75	@	4.25
Washables	3.00	@	3.50
Mixed Khaki Cuttings	4.25	@	4.50
O. D. Khaki Cuttings	4.75	@	5.00

Old Rags

White, No. 1—			
Repacked	3.75	@	4.25
Miscellaneous	3.00	@	3.25
White, No. 2—			
Repacked	2.60	@	2.85
Miscellaneous	2.00	@	2.25
Thirds and Blues—			
Repacked	2.00	@	2.25
Miscellaneous	1.90	@	2.00
Roofing Rags—			
No. 1	Nominal		
No. 2	1.10	@	1.20
No. 3 (bagging)	.90	@	1.00
No. 4	.90	@	1.00
No. 5A	.75	@	.85

Foreign Rags

New Rags

New Dark Cuttings	Nominal
New Mixed Cuttings	Nominal
New Light Silesias	Nominal
Light Flannelettes	Nominal
New White Cuttings	Nominal
New Light Oxfords	Nominal
New Light Prints	Nominal

Old Rags

No. 1 White Linens	Nominal
No. 2 White Linens	Nominal
No. 3 White Linens	Nominal

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SD—LOW OIL

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CAledonia 5-5260 to 69

No. 4 White Linens.	Nominal		
No. 1 White Cotton	Nominal		
No. 2 White Cotton.	Nominal		
No. 3 White Cotton.	Nominal		
No. 4 White Cotton	Nominal		
Extra Light Prints..	Nominal		
Ord. Light Prints...	Nominal		
Med. Light Prints...	Nominal		
Dutch Blue Cottons..	Nominal		
French Blue Linens..	Nominal		
German Blue Linens.	Nominal		
German Blue Cottons	Nominal		
Checks and Blues...	Nominal		
Linsey Garments....	Nominal		
Dark Cottons.....	Nominal		
Old Shopperies.....	Nominal		
New Shopperies.....	Nominal		
French Blues.....	Nominal		

Old Rope and Bagging

(Prices to Mill f. o. b. N. Y.)

Gunny No. 1—			
Foreign	2.25	@	2.35
Domestic	2.15	@	2.25
Wool Tares, light....	1.75	@	1.85
Wool Tares, heavy...	2.20	@	2.35
Bright Bagging.....	1.70	@	1.75
Manila Rope—			
Foreign	5.00	@	5.25
Domestic	5.25	@	—
Jute Strings.....	2.75	@	3.00
Sisal Strings.....	2.60	@	2.75
Mixed Strings.....	Nominal		

Old Waste Papers

(F. o. b. New York)

Shavings—			
White Envelope Cuttings	3.25	@	3.35
Ordinary Hard White No. 1....	2.60	@	2.70
Hard White No.2.	2.50	@	2.60
Soft White No. 1.,	2.40	@	2.50
Flat Stock—			
Stitchless	1.40	@	1.50
Overissue Mag....	1.40	@	1.50
Solid Flat Book...	1.20	@	1.30
Crumbled No. 1....	.90	@	1.00
Ledger Stock.....	1.30	@	1.35
New B. B. Chips....	.45	@	.50
Manila—			
New Env. Cut.....	2.20	@	2.30
New Cuttings.....	1.90	@	2.00
Old Kraft Machine— Compressed bales..	1.70	@	1.80
News—			
No. 1 White News	1.45	@	1.55
Strictly Overissue..	.85	@	.95
Strictly Folded....	.45	@	.50
No. 1 Mixed Paper..	.35	@	.40

Twines

(F. o. b. Mill)

(Soft Fibre)

Coarse Polished—			
India	.16	@	.18½
Belg. White Hemp	.17	@	.20½
India Compress....	.16½	@	.17
Fine Polished—			
Fine India.....	.22	@	.24
Unpolished—			
Box	.11¾	@	.12¼
Paper Makers.....	.11½	@	.13¾
Tube Rope.....	.12½	@	.15¼
Wall Paper.....	.13½	@	.14¾
Wrapping	.17	@	.21
Soft Fiber Rope...	.14¾	@	.15¼

(Hard Fibre)

Bond	.13½	@	.14
Anchor	.13	@	.14
Manila	.21	@	.28

Domestic	—	@	4.50
Transmission Rope...	2.00	@	2.25
Jute Rope.....	1.85	@	2.12½
Soft Jute Strings....	2.00	@	2.50
Jute Carpet Threads.	1.75	@	2.00
Gunny No. 1			
Foreign	—	@	2.25
Domestic	1.90	@	2.00
Bleachery Burlap....	4.00	@	4.25
Scrap Burlap—			
Foreign	2.15	@	2.25
Domestic	1.90	@	2.10
Scrap Sisal.....	—	@	2.40
Scrap Sisal for Shredding	—	@	2.40
Wool Tares, heavy...	—	@	2.20
New Burlap Cuttings	2.45	@	3.00
Aust. wool pouches..	—	@	3.00
Heavy Baling Bagging	2.40	@	2.60
Paper Mill Bagging..	1.75	@	1.80
Bagging No. 2.....	.80	@	.90

Domestic Rags (New)

(F. o. b. Boston)

Shirt Cuttings—			
New Light Prints.	.04	@	.04¼
New White No. 1.	.09	@	.09¼
New White No. 2.	.06¼	@	.07
New Light Flannelettes	.07½	@	—
Silesias No. 1.....	.07½	@	.07¾
New Black Silesias.	.04¼	@	.04½
Soft Unbleached....	.09¼	@	.09½
Blue Cheviot.....	.07¼	@	.07½
Fancy	.03¾	@	.04
Washable	.03	@	.03¼
Kraft, M. F.....	6.00	@	—
Cottons—According to grades—			
Blue Overalls.....	.07¼	@	.07½
New Black, soft.....	.04¼	@	.04½
Khaki Cuttings.....	.04½	@	.04¾
O. D. Khaki.....	.04¾	@	.05
Corduroy	.03¼	@	.03½
New Canvas.....	.07¾	@	.08¼
B.V.D. Cuttings.....	.08¼	@	.09

Domestic Rags (Old)

(F. o. b. Boston)

Canvas	.04½	@	—
White No. 1—			
Repacked	—	@	2.75
Miscellaneous	2.50	@	2.75
White No. 2—			
Repacked	1.90	@	2.00
Miscellaneous	2.00	@	2.25
Twos and Blues.....	1.75	@	2.00
Third and Blues—			
Repacked	1.37½	@	1.75
Miscellaneous	1.25	@	1.62½
Black Stockings.....	3.90	@	4.00
Roofing Stock—			
No. 1.....	—	@	1.20
No. 2.....	—	@	1.10
No. 3.....	.90	@	1.00

Foreign Rags

(F. o. b. Boston)

Dark Cottons.....	1.50	@	1.60
Dutch Blues.....	3.00	@	3.15
New Checks and Blues	2.85	@	3.00
Old Fustians.....	2.50	@	2.75
Old Linsey Garments	2.10	@	2.20
New Silesias.....	6.50	@	7.00

PHILADELPHIA

Domestic Rags (New)

(Price to Mill, f. o. b. Phila.)

Shirt Cuttings—			
New White, No. 1.	.08	@	.08½
New White, No. 2.	.04½	@	.05
Light Silesias.....	.05½	@	—
Silesias, No. 1....	.04½	@	.05
Black Silesias, soft.	.03½	@	.04
New Unbleached...	.06	@	—
Washable, No. 1..	.02	@	.02½
Blue Overall.....	.07	@	.07½
Cottons—According to grades—			
Washable, No. 2..	.02½	@	.04½
New Blue.....	.02	@	.02½
Fancy	.03	@	—
New Black Soft...	.04	@	.04½
New Light Seconds	.03½	@	.04
New Dark Seconds	2.00	@	2.25
Khaki Cuttings—			
No. 1 O. D.....	.04	@	.04½
No. 2 Mixed.....	.03½	@	.04
Corduroy	.02	@	.02¾
New Canvas.....	.04	@	.04½
New Black Mixed.	.02	@	.02¼

Domestic Rags (Old)

White No. 1—			
Repacked	4.00	@	4.50
Miscellaneous	3.00	@	3.50
Thirds and Blues—			
Miscellaneous	2.00	@	2.25
Repacked	2.50	@	2.75
Black Stockings (Export)	4.50	@	5.00
Roofing Stock—			
Foreign No. 1.....	2.20	@	2.25
Domestic No. 1....	2.00	@	2.10
Domestic No. 2....	1.90	@	2.00
Roofing Bagging..	1.75	@	—

Bagging

(F. o. b. Phila.)

Gunny, No. 1—			
Foreign	2.00	@	—
Domestic	2.25	@	—
Manila Rope.....	4.50	@	—
Sisal Rope.....	3.00	@	—
Mixed Rope	1.00	@	1.10
Scrap Burlaps—			
No. 1.....	2.25	@	2.50
No. 2.....	1.00	@	1.10
Wool Tares, heavy..	3.25	@	3.50
Mixed Strings.....	1.00	@	1.10
No. 1 New Light Burlap	3.00	@	3.50
New Burlap Cuttings	2.50	@	2.75

Old Papers

(F. o. b. Phila.)

Shavings—			
No. 1 Hard White.	—	@	2.60
No. 2 Hard White.	2.20	@	2.25
No. 1 Soft White..	2.25	@	2.30
No. 2 Soft White..	1.75	@	—
No. 1 Mixed.....	—	@	.85
Solid Ledger Stock..	—	@	1.75
Ledger Stock, white.	1.75	@	—
Ledger Stock, colored	1.50	@	—
No. 1 Books, heavy..	1.10	@	1.15
Manila Cuttings.....	1.80	@	1.90
Print Manila.....	.70	@	.75
Container Manila....	.65	@	—
Kraft Paper.....	1.75	@	—
No. 1 Mixed Paper..	.50	@	.55
Straw Board Chip..	.50	@	—
Binders Board Chip.	.50	@	—
Corrugated Board....	.70	@	.80
Overissue News.....	.70	@	.75
Old Newspapers.....	.50	@	.55

BOSTON

Old Papers

(F. o. b. Boston)

Shavings—			
No. 1 Hard White.	2.20	@	2.35
No. 1 Soft White..	1.85	@	2.15
No. 2 Mixed.....	.75	@	.80
Solid Ledger Books..	1.50	@	1.75
Overissue Ledger Stock	1.30	@	1.50
Mixed Ldgers.....	.85	@	.90
No. 1 Books, heavy..	1.10	@	1.20
No. 1 Books, light..	.65	@	.75
Crumpled Stitchless Book Stock.....	.50	@	.60
Manila Env. Cuttings	1.60	@	1.70
Manila Env. Cuttings, extra quality.....	2.20	@	2.30
No. 1 Old Manila...	.95	@	1.00
White Blank News..	1.30	@	1.40
No. 1 Kraft.....	1.60	@	1.70
Mixed Papers.....	.42½	@	.45
Print Manila.....	.65	@	.75
Container Manilas...	.27½	@	—
Old Newspapers.....	.42½	@	.45
Overissue News.....	.50	@	.65
Box Board Chips....	.42½	@	.45
Corrugated Boxes...	.55	@	.60
Kraft corrugated boxes	1.45	@	1.50
Screening Wrappers..	.60	@	.65

Bagging

(F. o. b. Boston)

Manila Rope—			
Foreign	4.25	@	—

CHICAGO

Old Papers

(F. o. b. Chicago)

Shavings—			
No. 1 White Envelope Cuttings....	3.30	@	3.40
No. 1 Hard White.	2.60	@	2.70
No. 1 Soft White..	2.10	@	2.15
Ledger & Writings..	1.40	@	1.50
Solid Books.....	1.25	@	1.30
Blanks	1.50	@	1.65
Krafts	1.00	@	1.25
New Kraft Cuts....	1.80	@	2.00
Manila Env. Cuts...	2.20	@	2.35
Ex. No. 1 Manila...	2.20	@	2.35
Print Manila.....	1.70	@	1.80
Overissue News.....	.80	@	.90
Old Newspapers—			
No. 1 Folded News	.80	@	.90
No. 1 Mixed Paper	.80	@	.90
Roofing Stocks—			
No. 1.....	2.00	@	2.25
No. 2.....	1.85	@	2.00

TORONTO

Paper

Bonds and Ledgers

Delivered

No. 1 White	.35½	@	.36½
No. 1 Tints	.36½	@	.37½
No. 2 White	.26½	@	—
No. 2 Tints	.27½	@	—
No. 4 White	.15	@	.1550
No. 4 Tints	.16	@	.1650
No. 5 Bond—White .	11.35	@	—
No. 5 Bond—Tints .	12.35	@	—
No. 5 Bond—Golden Rod	13.35	@	—
No. 5 Ledger—White .	11½	@	—
No. 5 Ledger—Tints.	.12	@	—
No. 6 Bond—White .	10.75	@	—
No. 6 Bond—Tints .	11.25	@	—
No. 6 Bond—Golden Rod	12.75	@	—
No. 7 Bond—White .	9.10	@	—
No. 7 Bond—Tints .	9.70	@	—
No. 7 Bond—Golden Rod	11.20	@	—
Book—			
No. 1 M. F.	7.10	@	7.35
No. 2 M. F.	6.85	@	7.20
No. 3 M. F.	5.60	@	6.20
No. 1 S. C.	7.60	@	7.85
No. 2 S. C.	7.00	@	7.35
No. 3 S. C.	6.10	@	6.35
No. 1 Coated and Litho	12.50	@	—
No. 2 Coated and Litho	11.00	@	—
No. 3 Coated and Litho	9.50	@	10.00
Coated tinted.....	13.00	@	13.50
Wrapping—delivered—			
Rag Brown.....	4.85	@	5.55
White Wrap.....	4.00	@	—
"B" Manila.....	4.90	@	6.25
No. 1 Manila.....	5.50	@	7.00
Fiber	5.50	@	—
Kraft, No. 2.....	5.50	@	—

(F. o. b. Cars, Toronto)

News, per ton—			
Rolls (contract)...	38.50	@	—
Sheets	45.50	@	—

Pulp

Ground wood.....	30.00	@	31.00
Unbleached Sulphite	52.00	@	53.00
Book (Class 1).....	65.00	@	66.00
Writing (Class 2)...	66.00	@	67.00
Select (Class 3).....	67.00	@	68.00

Old Waste Paper

(In carload lots, f. o. b. Toronto)

Shavings—			
White Env. Cut...	2.50	@	—
Soft White.....	2.15	@	—
White Blk. News..	1.25	@	1.40
Book and Ledger—			
Flat Magazine and Book Stock (old)	1.00	@	—
Light and Crumpled Book Stock.	.85	@	—
Ledgers and Writings	1.20	@	—
Manilas—			
New Manila Cut...	1.50	@	—
Printed Manilas...	.70	@	—
Kraft	1.00	@	1.70
News and Scrap—			
Strictly Overissue..	.75	@	—
Strictly Folded....	.80	@	—
No. 1 Mixed Paper..	.65	@	—

Domestic Rags

(Price to mills, f. o. b. Toronto)

No. 1 White Shirt Cuttings	.09	@	.09¼
Fancy Shirt Cuttings	.03¾	@	.04